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ON THE DESTRUCTIVE NATURE OF THE BORING  
SPONGE, WITH OBSERVATIONS ON ITS  
GEMMULES OR EGGS.

BY JOHN A. RYDER.

IN 1871 a vessel laden with marble was sunk in Long Island sound, and according to Prof. Verrill, the boring sponge has penetrated the exposed parts of the blocks for a depth of two to three inches from the surface. The canals or tunnels in a specimen of this marble which I have examined, vary from one-fourth to an hundredth of an inch and less in diameter; the canals are coated within with a thin film of dried sarcode of a brown color, which was orange-colored in life. Though the sarcode is dried, the needle-shaped spicules are plainly visible under a one-fifth inch lens, and display the form usually seen in the same species found on the coasts of Europe. The spicules, according to my measurements are  $\frac{1}{83}$  of an inch long, agreeing exactly with the length given by Mr. H. J. Carter as observed in British specimens, and about  $\frac{1}{10000}$  of an inch in diameter, and are, as is well known, siliceous. The specimen which I have seen, shows, in what appears to have been the inner portion of the block, a series of large branching canals which connect freely with each other in the most irregular way imaginable; moreover, the form of the canals in transverse section is exceedingly variable, being oval or irregular as often as it is circular. These last facts, together with that of the great variability in the calibre of the canals, leaves no doubt in my mind that it is the animal of the sponge which does the boring, and not marine worms which have politely abandoned their bur-

rows for the accommodation of this toiler of the sea. It is well known that this species and its allies are found filling systems of canals in the shells of many species of mollusks, both dead and alive, as well as in fragments of limestone, but it is probably rare to find it in such a vigorous condition of development as in the submerged cargo of marble referred to above. Mr. H. J. Carter believes that occasionally some of the parasitic species do not bore their habitation but develop freely in the same manner as ordinary non-parasitic forms. Bowerbank in his "Monograph of the British Spongidae," mentions an affiliated species which is parasitic on a sea-weed, boring or dissolving away the soft parts and allowing the harder fibrous structures to remain as a means of support.

It may be well to bear in mind that these sponges, notwithstanding the fact that they excavate their own habitations, are not parasites in the sense in which nematoid and cestoid worms are parasitic, as Haeckel, with his usual sagacity, points out in his Monograph of the Calcareous Sponges.

Dr. O. Schmidt observes (Brehm's Thierleben), that, "A large portion of the coasts of the Mediterranean and Adriatic seas is composed of calcareous material which, from its tendency to become eroded, has a broken, jagged aspect, giving it a peculiar and often attractive appearance. Of such broken Dalmatian coast one can certainly measure off some thousands of miles of strand, and where it does not descend too abruptly, large and small stones and fragments of rocks cover the ground. One can scarcely pick up one of these billions of stones without finding it more or less perforated with holes and eroded by *Cliona*, often to such a degree that the spongy remains of the apparently solid stone may be crushed in the hand." The same writer farther observes: "This brings us finally to the question, by what means does this sponge eat its way into the rock? One would first think of the siliceous needles as the cause, but we soon see that we must abandon the notion that this is the boring apparatus, since it must be borne in mind that such apparatus must be operated. Even though the protoplasm executes delicate fluctuating movements, so that in *Cliona* (*Vioa*), as in many other sponges, the needles are drawn into bundles, rows or series in particular directions, in any case, the force so exerted would not be sufficient to scrape or erode the lime rock with their

points. The mode of distribution and extension of the sponge would rather indicate that a process of chemical solution was the real agent at work in erosion. Of the exact constitution of this corrosive fluid we, however, as yet know nothing. The importance of the boring sponge in helping to effect the redistribution of eternal matter, does not consist in comminuting the stone into particles, but in dissolving it as sugar is dissolved in a glass of water, and mingled with the sea-water in this dissolved condition. Out of this solution the innumerable shell-fish take the mineral materials which have been mingled with their blood, and from which it is deposited as new layers on the shell, which, when the animal dies, either is also finally redissolved by the sponge, or falls to the bottom of the sea as a contribution to the earth's strata of future æons."

Dr. Leidy<sup>1</sup> observes in regard to the agency of this organism in disintegrating the shells of dead mollusks, "that an extensive bed of oysters, which had been planted by Thos. Beasley at Great Egg harbor, and which was in excellent condition three years since (1857), had been subsequently destroyed by an accumulation of mud. The shells of the dead oysters, which were of large size and in great number, in the course of two years have been so completely riddled by the boring *Cliona*, that they may be crushed with the utmost ease, whereas without the agency of this sponge the dead shells might have remained in their soft muddy bed devoid of sand and pebbles, undecomposed perhaps even for a century." The ability of such an organism to comminute both organic and inorganic calcareous materials is well illustrated in the instance above cited, and their influence in modifying the character of marine deposits is clearly implied.

In a specimen of the common *Ostrea virginiana*, recently handed me for examination by my friend, Mr. John Ford, the substance of the shell was thoroughly cavernated so as to render it extremely brittle and readily crushed; in fact the inner table of the shell left standing showed a great number of elevations within, which indicated points where the intruding parasite had been kept out by the oyster which had deposited new layers of calcareous matter at these places so as to give rise to the elevations spoken of. Besides this, the inner table had become so weakened at the insertion of the adductor muscles that the animal

<sup>1</sup> Proc. Acad. Nat. Sciences, Phila., VIII, 162.

in closing had torn a part of it loose, which had been repaired by the deposition of a brown horny substance. Evidence of the presence of the boring sponge may very frequently be noticed in shells of oysters brought to the markets, though it often appears as if the parasite had left its work incomplete, being killed on its host. I find that Schmidt has also noted this, and that the boring operations of the sponge usually seem to stop in the case of living mollusks, at the nacreous layer.

Dr. Leidy (l. c.) gives a lucid account of the living sponge as found in *Ostrea virginiana* and *Venus mercenaria*. He says, "This boring sponge forms an extensive system of galleries between the outer and inner layers of the shells, protrudes through the perforations of the latter tubular processes, from one to two lines long, and one-half to three-fourths of a line wide. The tubes are of two kinds, the most numerous being cylindrical and expanded at the orifice in a corolla form, with their margin thin, translucent, entire, veined with more opaque lines, and with the throat bristling with siliceous spiculæ. The second kind of tubes are comparatively few, about as one is to thirty of the other, and are shorter, wider, not expanded at the orifice, and the throat unobstructed with spiculæ. Some of the second variety of tubes are constituted of a confluent pair, the throat of which bifurcates at bottom. Both kinds of the tubes are very slightly contractile, and under irritation may gradually assume the appearance of superficial wart-like eminences within the perforations of the shell occupied by the sponge. Water obtains access to the interior of the latter through the more numerous tubes, and is expelled in quite active currents from the wider tubes."

A point of considerable interest in this connection is Mr. W. J. Sollas<sup>1</sup> discovery of the existence of membranous and spiculiferous diaphragms in some English species of these sponges. These diaphragms are composed of sarcodine in which, in some instances, very short club-shaped spicules are imbedded, pretty densely packed together, with their opposite extremities lying at opposite surfaces of the diaphragm. In some cases the diaphragms are perforate, forming an annular band inside the canal and attached by an edge, the other edge being constricted somewhat, so that the bands sometimes have the form of hollow truncated cones. In other instances these partitions are membranous films contain-

<sup>1</sup> Am. Mag. Nat. Hist., 5th Series, Vol. I, No. 1, 1878, p. 54.



ing spiculæ of the ordinary form; these also may be perforate or imperforate and conical. Their office is not yet understood, but it is suggested by their discoverer that they are for the purpose of interrupting or modifying the direction and flow of the currents of water created by the ciliated cells of the tissue lining the cavities of the organism.

In the examination of a second specimen kindly handed me by Mr. Ford, and which had been removed from its native brine only a few hours before, I was enabled to distinguish very plainly the ova or gemmules strewn through the orange-colored sarcode. These are bodies fully three times as large in diameter as the ordinary sponge cell, of an oval shape covered with a tough transparent rather thick membrane. The contents are transparent and granular with the exception of the nucleus, which is opaque and deep-orange in color and is often broken up into several apparently homogeneous granules of variable size; a part of these granules may occupy one extremity of the ovum, another part the other, or they may be placed eccentrically, or be arranged in a semicircle. The diversity in this respect is very great, so that but few are met with which are very nearly alike. These differences may represent various stages of development, but there seems to be a want of the orderly arrangement which would be expected if this were the case, besides, the wide separation of the nuclear bodies into two and even three parcels would not favor such a view.

I was quite unable to distinguish any flagellate cells in this specimen, even with a power of 1000 diameters, although there can be little doubt of their existence, as may be inferred from Prof. Leidy's account of the physiological actions of the organism. Mr. Carter, however, has figured these cells in a paper already referred to, and he observes that the flagelliform processes of the cells lining the canals of the fresh-water sponges are withdrawn into the sarcode body of the cell soon after being detached from the walls of the canals, which may have been the trouble in this case.

## THE MESOZOIC SANDSTONE OF THE ATLANTIC SLOPE.

BY PERSIFOR FRAZER, JR.

THREE pamphlets lie on our table and constitute very important additions to the knowledge of the most puzzling of all geological formations, viz: that portion of the series lying between the Carboniferous and Cretaceous in this country. They are entitled as follows: "The Mesozoic Formation in Virginia, by Oswald J. Heinrich, Mining Engineer,"<sup>1</sup> "Notes on the Mesozoic of Virginia, by Wm. M. Fontaine,"<sup>2</sup> and "The Physical History of the Triassic Formation of New Jersey and the Connecticut valley, by Israel C. Russell."<sup>3</sup>

Without disparaging the merits of the other two, it must be said that the paper of Mr. Heinrich embraces more exact and positive knowledge of lasting value than either of the others. To complete the set, there should be added to the three just mentioned, a pamphlet of a few pages, by Persifor Frazer, Jr., on "The Position of the American New Red Sandstone" (read at the New York meeting of the A. I. M. E., Feb., 1877). In this paper there is a column of strata represented in a section across the Mesozoic belt from York to Dillsburg which will be of interest to those who have carefully read Mr. Heinrich's pages.

These contributions, taken together, are so valuable that a brief sketch of their separate contents will be of interest.

*Frazer's Paper.*—To take them in the order of their date, Frazer speculates upon the probable relationships of the various strata represented in his broad section with those of the European column, rather leaning to the belief that the rocks of Mesozoic age in Southern Pennsylvania, correspond with those which fill in the space occupied by the upper half of the lower Permian and the superior beds at least to the base of the Lias (*i. e.*, including the Rhætic beds). He says: "By this hypothesis the 'New Red' of York and Adams counties would reach from the middle portion of the lower half of the Dyas or Permian at least to the base of the Lias, including all the rocks attributed to the Trias and the beds below it, except the lower

<sup>1</sup> Read at the Phila. Meeting of the American Institute of Mining Engineers, Feb., 1878.

<sup>2</sup> American Journal of Science and Arts, Jan., 1879.

<sup>3</sup> From the Annals of the New York Academy of Sciences. 1878.

Rothliegendes of the German scale." The thickness calculated by him for Prof. Rogers' section below Yardleyville is 51,500 feet, or nine and three-quarters miles, on the assumption that the bedding is normal, but this is regarded as delusive; and in a subsequent paper, by the same author, on "Some Mesozoic Ores" (Am. Phil. Soc. Proc., April 20, 1877), the wave-strewing hypothesis, by means of which Prof. Rogers sought to explain the inclined bedding is rejected as insufficient to account for all the phenomena.

Mr. Heinrich's paper is rich in facts, and is as remarkable for the absence of speculations as it is for the clear and logical standpoint from which he views the whole subject. Like Prof. Fontaine, he commences by describing the divisions of the formation into belts, but whereas Mr. Heinrich groups all the known exhibitions of Mesozoic, in Virginia, into four belts, Prof. Fontaine disposes of them in six belts. This latter arrangement does not seem to be necessary by reason of the small gaps between the various members of Heinrich's belts, and presents to the student not on the ground, manifestly greater inconveniences.

It is evident that even Heinrich's number of divisions is arbitrary, since a prolongation of the "Eastern" belt crosses the "Middle Eastern" at Taylorsville and joins the "Middle Western" at Mount Vernon," but these separate ranges and the lines indicating them on his map, greatly assist the understanding of his minute details. His belts here follow.

- A *Eastern*.—Includes (1) the Petersburg deposits, and (2) the scattered masses of Mesozoic in Greenville and Brunswick counties, west of Hicksford and east of Lawrenceville.
- B *Middle Eastern*.—(1) Taylorsville deposits, (2) Springfield deposits, (3) Richmond deposits.
- C *Middle Western*.—(1) Aquia deposits, (2) Farmville deposits, from Mount Vernon to Fredericksburg.
- D *Western*.—(1) Potomac deposits, running from the Potomac river near Point of Rocks to the Wilderness, (2) Barboursville deposits, (3) James River deposits (near Scottsville), (4) Danville deposits, (5) Dan River deposits, on and south of the N. Carolina line.

Prof. Fontaine calls D 1 his "*New Jersey*" belt, D 3 his *Buckingham* belt, D 4 the *Pittsylvania* belt, C 2 (or a part of them) the *Prince Edward* belt, B 3 and a part of A 1 the *Richmond* belt, the southern portion of A 1 the *Petersburg* belt, which Prof. Fontaine describes as overlapping the Hanover area (*i. e.*, the

northern part of the *Richmond* belt [?]), whose uppermost beds pass into the lowermost of the *Petersburg* belt; and finally a seventh belt C 1 or the *Fredericksburg* belt. The area (or areas) covered by Mesozoic near Hicksford, which constitute the portions of Mr. Heinrich's A 2, Prof. Fontaine does not name, as he acknowledges that he has not visited them.

Mr. Heinrich's lucid and careful observation of the rocks which follow that of the boundaries of his belts, cannot be too highly commended. They are classed as 1, Conglomerates; 2, Sandstones, (*a*) Psephites or Siliceous and Feldspathic, and (*b*) Psammites or argillaceous matter with fine siliceous sand and some larger grains of quartz; 3, Slates and Shales; 4, Limestones; 5, Coal, (*a*) bituminous, (*b*) carbonite, (*c*) natural coke, (*d*) semi-anthracite; 6, igneous rocks; 7, accessory minerals.

The following six pages are devoted to a very good sketch of the general geological and stratigraphical characters of the formation, consisting of some useful information as to areas of drainage.

This third division of his subject ends with a succinct description of the results of diamond-drill boring, and the separation of the measures pierced, into seven groups. This is an exceedingly interesting portion of the paper, each division is so clearly distinguished from the others by striking characteristics as to seize the attention of the reader, who is too apt to forget that he sees so clearly because he is looking through Mr. Heinrich's eyes.

The next six pages are given up to a detailed lithological description of the section by inches. The third chapter closes with a summary of the results of investigation, and an observation (confirmed by the study of the measures near Dillsburg, Pa.) that the largest beds of trap, more frequently followed planes of bedding than planes of cleavage.<sup>1</sup>

The fourth division of his subject is devoted to the fossil remains of the formation, but here Mr. Heinrich confesses his inability to do justice to the subject, and Prof. Fontaine's information is fuller and has the additional advantage of his own excellent critical judgment, at least so far as concerns the flora.

The fifth and last division of Mr. Heinrich's report regards the economical products of the formation, prominent among which, of course, is the coal. Forty-nine analyses are given on p. 42,

<sup>1</sup> Frazer's Report. CC, Sec. Geol. Surv. of Penna.

about equally divided between the north and south sides of the James river. On the succeeding page six analyses are given of West Virginia coals, and three from the Richmond basin. On p. 44 is a table of the coal shipped from the basin in various years, and the whole concludes with a comparative table of the total amounts shipped from the principal basins in Pennsylvania and Maryland, and from the Richmond basin.

The illustrations are on two plates; Plate I contains a map of Virginia and part of North Carolina, south of the Potomac and east of the Blue Ridge with the lines of strike of the four belts into which the author has thrown the formation. The areas of drainage are well marked on this map, and the Mesozoic shaded.

Plate II contains, Fig. 1, a geological section of the bore hole; Fig. 2, a section of the beds on a vertical plane perpendicular to the strike; Fig. 3, a long section along the James river from Richmond to Scottsville, showing a synclinal between the western and middle western Mesozoic belts, a synclinal in the middle eastern, and a probable eroded anticlinal between the latter and the eastern, where the rocks seem to dip under newer formations to and under the sea.

In this connection it is almost a pity to note even trifling errors in Mr. Heinrich's paper. These are not confined to "elliptic" for elliptical (p. 7), "dolorite" for dolerite (pp. 17 and 37), square acres (p. 41), and other similar oversights of the proof-reader in correcting the text, but may be even found in the maps, as in "Ezoic" for Eozoic (Plate II Fig. 3, &c.). It was to be hoped that these defects would have been corrected in the volume of the Transactions of the Institute of Mining Engineers, in which the paper appears.

*Prof. Fontaine's Paper.*—After his grouping of the outcrops of the Mesozoic previously given, the author notices a deposit of stones which plays an important part in the NW. They are neither conglomerate nor boulders. Under this head is classed the "Potomac Marble," which is all of limestone fragments. In the Pittsylvania belt, however, the stones are the product of the granite and azoic rocks lying near.

In his description of the Richmond basin, Prof. Fontaine has probably been led into error by Rogers and Lyell, and in spite of his own notes, when he says, "The lower series, from three to five hundred feet thick, rests immediately on the granitoid gneiss,

which forms the floor of the basin. It contains all the coal found in the field."

Mr. Heinrich's careful column shows the lowest coal (not counting occasional bituminous and carbonaceous slates and sandstones) is found at 571 feet from the granite, the second at 600 feet, the third and fourth at 655 feet.

On this subject Mr. Heinrich's remarks (p. 35) are very instructive; for even the variable distance noticed by the author between the granite floor and the coal could scarcely account for so great a discrepancy. The faults in the Midlothian region are conceded by all, and Mr. Heinrich's section presents a very rational view of them; but why "borings cannot be relied upon" is not clear, though of course their value as guides decreases as the distance to the desired locality increases. One would suppose that they were all that could be relied upon.

A very interesting note in regard to certain varieties of the Potsdam strata, connect with this horizon the "compact vitreous quartzites and peculiar sandstones which have the grains of sand imbedded in a white, non-plastic, argillaceous matter," occurring a short distance above Harper's Ferry. Such rocks are indeed noticed elsewhere in positions entitling them to be considered Potsdam, but if by this are intended the quartz fragments imbedded in crystalline schist which make the high bluffs at Harper's Ferry on the Maryland side of the river, it is most interesting to note that they are strikingly similar to a great series composing the middle and western portions of the South mountain in Pennsylvania underlying the Orthofelsites and schists of probable Huronian age. Neither is the *Scolithus* a sure guide to the age of Potsdam in the opinion of all geologists.

The clay deposits and their supposed origin in "marshes within the Azoic area swept away in a general and extensive erosion," present certainly a new if somewhat hazardous line of dynamo-geological speculation, as also does the evident leaning of the writer towards a glacial movement to account for deposits of schists, granites, &c., on grit. It is noteworthy that Prof. Fontaine, Mr. Russell and others, each from his independent line of argument, arrives at the probability of a series of shallow and marshy beds to the south of the Mesozoic belts.

But the most novel explanation of the paucity of animal life in the Trias and Jura is that which supposes this time to have been one of great cold, when a huge ice sheet was advancing eastward

from the Blue Ridge, and its streams were feeding the Mesozoic areas. The ferns, cycads, &c., were furnished with a mild equable and moist climate by fogs from the Gulf Winds.

In this part of his argument it is difficult to follow the author, who would produce the glaciers by the cold winds sweeping east and north-east unchecked from the Pacific, while an "immense growth of coniferous trees covered the hills."

The problems with which Prof. Fontaine closes his paper, as to whether some of the drift in the northern States attributed to the Glacial period may not be much older; and whether there may not be drift deposits around the southern prolongation of the Appalachian chain, thus carrying an ice period into the far South to meet that of Prof. Agassiz in Brazil, are, as he says, well worth the attention of geologists.

In this paper the main points of interest are his belt of stones in the north-west and under the Catoctin range; his criticism of Schimper's determination of *Equisetum rogersii*, and his association of the ferns with the "Rhætic" beds, or their contemporaries, his establishing the drift matter of Azoic fragments in clay as passing under the Cretaceous in Maryland, and his conclusions as to the great eroding action of a glacier previous to or coincident with the laying down of this drift.

*Mr. Russell's Paper.*—This is concerned nominally with the New Jersey Triassic, but includes observations on the New England and British American Trias as well. These rocks and the protecting action of their traps in the bay of Fundy are first considered, and the tidal action on the soft muds is afterwards referred to as a good example of the kind of action which produced these soft ripple-marked shales.

In endeavoring to give, from a few localities in New Jersey, a general idea of the characters of these shales and sandstones, it must be confessed that either their variety is singularly curtailed on the crossing of the Delaware into New Jersey, or many of the diverse representatives mentioned by Messrs. Frazer, Heinrich and Fontaine must here be classed under the same names.

Note A refers to a *south-westward* dip of the Trias just east of the Blue Ridge in Virginia. Fontaine gives this dip of his "New Jersey belt" as north-west, while Heinrich's section makes it east or south-east.

An italicised paragraph seems to claim novelty for the conclusion to be drawn from the fact that in New England the dip of



the Trias was south-east, in New Jersey north-west, while in Virginia and North Carolina the flexed structure was apparent.

This is more definitely stated on p. 11, where by the aid of a diagram it is insisted that the Triassic beds in New Jersey and Connecticut are but flanks of a great arch, the upper portions of which have been removed by denudation. The lithological evidence which the writer has accumulated in favor of this old view must be considered of value. Mr. Heinrich enunciates the same view, pp. 22 and 23, but on the ground of supposed analogy between the James and Hudson rivers, and indeed this structure has been accepted, if not with the foundation which Mr. Russell now gives to it, by many geologists from the date of the first Geological Surveys of New York and Pennsylvania to the present time.

Apropos of the writer's views of the possible agency of the traps as lines of displacement, it is worth observing that the largest and strongest dykes are found by Frazer (Report CC, Second Geol. Surv. of Penna., p. 325), and Heinrich, to follow planes of cleavage. This fact, as stated in the first part of the above, is proof that no large amount of displacement took place, since the strata themselves and other beds of trap parallel with the bedding, which pursue one direction, and those cleavage dykes, are as so many keys to structure, for *no* displacement of beds could take place without displacing these. Rogers' theory of the apparent great accumulation of the Mesozoic beds is not quite correctly stated, p. 9 (See note on this subject in Frazer's Position of Am. New Red, &c., p. 5).

The supposition that the conglomerate was derived from the accumulation of pebbles at the mouths of rivers, is not borne out by observations of this characteristic rock along the western border of the Trias in Pennsylvania, for it is uniform in character for long distances, and according to Fontaine, the most abundant stones in Virginia could not have come from a point further south than the Lower Silurian of Pennsylvania.

The two authors, Prof. Fontaine and Mr. Russell, unite in their belief that the Triassic conglomerate is an important landmark in the formation, but they ascribe its origin to very different causes. Whereas the former imagines it to have been carried to its present position on ice rafts, the latter ascribes it to the deposition of numerous river mouths pouring out into the sound in which the rocks of this age were being laid down.

The text accompanying diagram, p. 16, is not clear, and therefore cannot be criticised. The conglomerates of Maryland and Pennsylvania do seem to mark two horizons near the upper and lower parts of the New Red series.

Another oversight is the assertion that the bold line of bluffs composed of crystalline schists can be followed to a distance from Stony Point, N. Y., towards Virginia, sufficiently far to account for the conglomerate of that edge as its shore deposit. Over long stretches of this intervening distance the only high ground is made of these coarse and hard beds.

In the summary of reasons for accepting the theory of unity between the New England and New Jersey Mesozoic, considerations Nos. 3 and 4 seem to be new and valuable. No. 1 is valuable. No. 2 if true of New Jersey is not so in Pennsylvania, where on the very eastern margin of these beds, in York county (as on the western), the rock is a conglomerate (See Report C, Second Geol. Surv. of Penna., and CC *Ibid*, p. 264. Section 6. Frazer). No. 5 on the continuity of elevated ground, if well founded from Hudson river to New England, is not so for the entire course south-west.

In the discussion of the eruptive rocks Mr. Russell makes a very interesting point in regard to the crescent shape of the outbursts of trap in the New England and New Jersey Trias. In the former the horns of the crescents turn eastward, while the convex side is towards the west, whereas in the New Jersey series this order is reversed.

But it is evident that the trap rocks of New Jersey must differ materially from those in Pennsylvania, and also in Connecticut, because he states that "they are usually composed of an intimate combination" (*sic*) "with some form of feldspar." They very rarely contain any hornblende elsewhere, and in the large collection of traps from Pennsylvania there are but one or two, and these from exceptional localities in which hornblende has been detected. Another difference lies in the fact that it is not difficult to find the junction of the trap with the shales and sandstones that underlie them. In Pennsylvania this is always difficult and sometimes impossible.

Mr. Russell expresses the same view of the effect of a sinking of the floor, or what is the same thing, a rising of the eastern margin of the Mesozoic area, as that given in CC, 2d G. S. of Pa., pp. 269 and 271.

Page 28, he under-estimates the amount of thickness of rocks with which he has to deal if he employ the "usual manner" of calculating it, for Rogers' and Frazer's sections of the New Red in Pennsylvania make the total thickness 51,000 feet.

It is interesting in Note B to find Mr. Russell also testifying to the probable high and swampy character of the southern end of the Triassic estuaries.

Taking the papers together, we cannot fail to recognize that they form a very valuable and suggestive arsenal from which to draw weapons to renew the old attack on the New Red.

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## ON UNSYMMETRIC ARROW-HEADS AND ALLIED FORMS.

BY S. S. HALDEMAN.

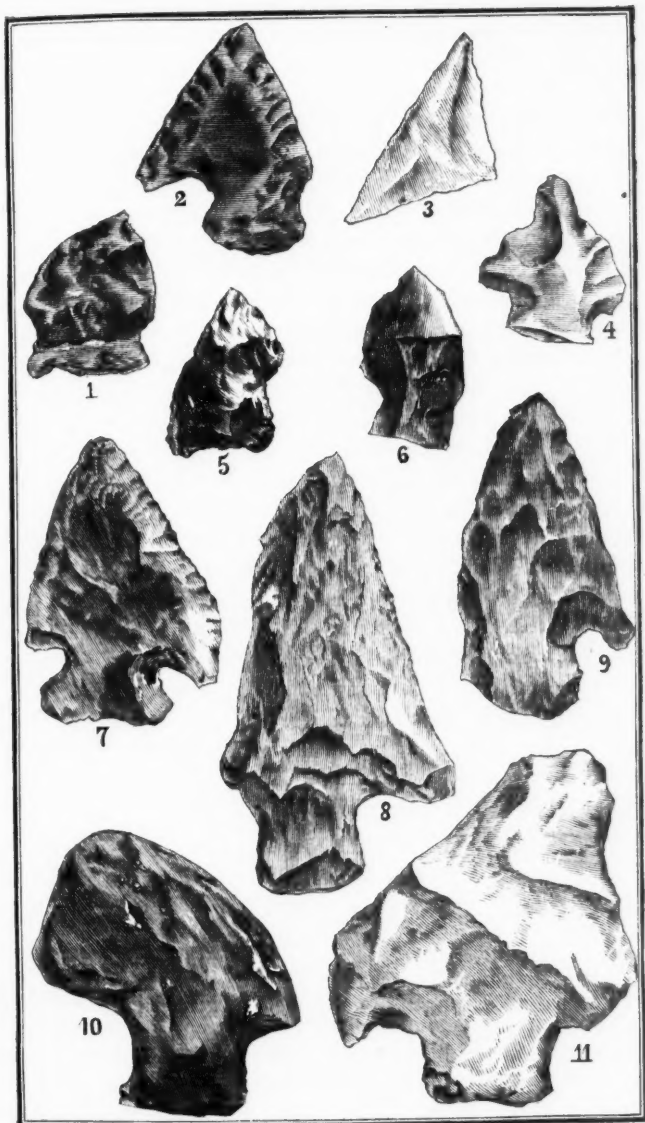
ALTHOUGH most stone arrow-heads have a symmetric outline, a large collection will generally present variations which may be due to unsuitable material, to want of skill in the workman, to a love of variety, to intentional adaptation to a purpose, or to the consideration that a single barb might be sufficient. Love of ornament appears in the use of paint,<sup>1</sup> and in the selection of finely colored jasper and chalcedony for implements.

While irregularities would interfere with the function of arrows, all these objects are not to be regarded as arrow-heads, some of the larger kinds being for spears, while others are probably borers (Fig. 4), scrapers (Fig. 10) and knives (Fig. 8). As in civilized life, the workman whose kit is limited must make one implement serve the purposes of several. In fact, the enterprising explorer, Major J. W. Powell, brought from the Rio Virgen small knives of what would be regarded as arrow-heads if found detached, but which were fastened (with the gum of *Larrea mexicana*) in a notch in the end of a round wooden handle (see Fig. 1, p. 2, in Rau's Archæol. Collections of the National Museum).

The want of symmetry may be in the form of the body (Figs. 1, 3, 4, 8), in the shape and inequality of the barbs (Figs. 7, 11), and in the slight indication, or the absence of one of the barbs (Figs. 2, 5, 6, 8, 9).

A barb may be accidentally broken off during or after making,

<sup>1</sup> I have an arrow-head from Tennessee, one side of which is painted with a ferruginous red color.



as shown in many examples where the surface of fracture remains. In others, the unarmed side is finished uniformly, as in Fig. 9, where the simple edge runs from base to point, but we may infer that a workman would economize a broken specimen by shaping it anew, as basal and terminal halves are turned into scrapers.

Want of symmetry in the barbs occurs in the short sub-triangular forms (Fig. 11) which are often of large size, with one prominent barb—forms probably intended for fish-gigs.

Mr. Ch. C. Jones (*Antiquities*, p. 266-7) does not figure abnormal forms, which he regards "as examples rather of misfortune than of original design." But even failures are worthy of record, and some of the forms may have been adapted to a purpose.

Figs. 1, 2, 4, 5, 6, East Tennessee (L. and F. A. Stratton); Fig. 3, an obtuse-angled triangular form, with all the edges sharp; the base or shortest side in some specimens slightly convex; probably knives and scrapers; white quartz; Chester county, Pa. (H. R. Kervey); in the one figure the base is longer than usual. Fig. 5 resembles an equilateral form, in one side of which an indentation had been made to adapt it for scraping, or for tying it to a handle; black flint. Fig. 7, Liberty county Ga. (Dr. J. L. Le Conte.) Fig. 8, Pennsylvania (?). Fig. 9, Arkansas (?). Fig. 10, Bainbridge, Lancaster county, Pa. (F. G. Galbraith); the longest edge is dulled and smoothed by use, as if in polishing or scraping the inside of earthenware. Fig. 11, Tallahassee, Fla.; white semi-opal (C. N. Haldeman). The figures are of the size of the originals.

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## EXAMINATION OF INDIAN GRAVES IN CHESTER COUNTY, PENNSYLVANIA.

BY EDWIN A. BARBER.

IN the year 1824 there appeared in the *Village Record*, at West Chester, then edited by Charles Miner, Esq., a long and elaborate series of communications written, evidently, after careful research and personal inquiry, by Joseph J. Lewis, Esq., then a young law-student, and now one of the most distinguished members of the bar of Chester County."<sup>1</sup> In

<sup>1</sup> Historical Collections of the State of Pennsylvania. By Sherman Day. Phila., 1843. Page 207.

one of these communications the following paragraph appeared: "There is a place near the Brandywine, on the farm of Mr. Marshall, where there are yet a number of Indian graves that the owner of the ground has never suffered to be violated. One of them, probably a chief's, is particularly distinguished by a head and foot stone."<sup>1</sup>

Having recently obtained permission from the present owner of the property, Mr. Caleb Marshall, some of the members of the Philosophical Society of West Chester, on the 16th of November, 1878, proceeded to investigate these graves. The burial-ground is situated in a group of hickory and oak trees on a prominent knoll some three hundred yards to the north of the west branch of the Brandywine or Minquas creek, formerly known to the Indians as the *Suspeough*. "The Indians upon the Brandywine had a reserved right (as said James Logan in his letter of 1731) to retain themselves a mile in breadth on both sides of one of the branches of it, up to its source."<sup>2</sup>

The exploring party found traces of at least thirty graves, indicated by shallow depressions, but originally there was a much larger number, as Mr. Marshall asserts that the plough has been gradually encroaching upon the cemetery, all signs of many of the graves having been entirely obliterated. The portion yet protected by the receding grove, however, has never been disturbed.

Four of these burial places were opened, with the following results: In the first grave, at the depth of three feet was found a skeleton stretched at full length on the back, from east to west, the face turned toward the north-west, the arms extended close to the body. Around the neck were nineteen spherical, opaque, milky-white, Venetian beads, each about an inch in diameter. These glass beads are similar to some found in Northumberland county and other portions of the State, and had undoubtedly been supplied to the Indians by the early settlers. This grave was filled with the prevailing red clay of the surrounding country and was exceedingly stony and loosely packed. The skeleton rested on a rude floor of rock.

In the second grave another skeleton was unearthed, at the depth of three and a half feet, having the same orientation as

<sup>1</sup> *Ib.*, p. 208.

<sup>2</sup> Watson's *Annals of Philadelphia*, Vol. II, p. 160.

number one, but lying on the left side, with the face turned upwards. Associated with the skeleton were the following articles: Around the neck was found a large number of European beads, consisting of ten-sided amber-colored glass beads the size of a large pea, and quantities of small cylindrical Venetian beads colored white and blue. Three objects of aboriginal workmanship were also found in this grave, consisting of two finely chipped *gun-flints* and a highly polished flat elliptical stone of a dark color, three inches in length. These were the only articles of native manufacture found in any of the graves. A quantity of a red clayey substance resembling paint occurred in this grave, which in all probability had been employed by the Indians in personal decorations. Close to the right hand of the body were found two European white clay-pipes of a pattern employed during the seventeenth century; on the bowls the maker's stamp (R T) was impressed.<sup>1</sup> Around the skeleton were found thirteen wrought-iron nails, two to three inches in length, much corroded, with fragments of decayed wood adhering to them. The body had evidently been enclosed in a wooden box.

In the third grave, three feet nine inches below the surface, were found a skull and portions of bones much decomposed, the body extended on the back, face up, head toward the east, as in the preceding cases. In this grave nothing was found associated with the skeleton save a single coffin nail.

Grave number four revealed nothing but some fragmentary bones.

Mr. Marshall states that a couple of stones years ago were found on the surface of the burial-ground, which were covered with pictorial etchings. These were doubtless the same alluded

<sup>1</sup> In the beginning and middle of the seventeenth century, pipes were made by various makers in the vicinity of Bath, England. Amongst these was Richard Tyler, and the initials R. T. in all probability were impressed at his manufactory. We can, therefore, with some degree of certainty assign to these pipes an approximate date. The earlier British pipes, sometimes called "Elfin" or "Fairy Pipes," and by some antiquaries attributed to the *Romans*, made, however, in the reign of Elizabeth, frequently possessed the initials of the makers' names on the bases of the flat spurs which characterized them. These were gradually superseded by pipes with elongated bowls, in which the spurs or heels were pointed or entirely absent. The more recent English pipes of the last century or thereabouts had the names of the makers stamped on the stems. The examples in question are of the elongated pattern, minus the heel, with the initials stamped in the *bowls*. The stems have been broken off about six inches from the bowls, having been originally longer. They were brought to this country by the earlier settlers and traded to the Indians.



to by Mr. Lewis, and in all probability marked the resting-place of some distinguished man of the tribe. Unfortunately they were removed and carelessly thrown into the public road some time ago, where they probably remain to this day imbedded in the soil. The exact location of these interesting relics, however, can only be surmised, and in all probability they will never be recovered. Indian Hannah, the last of this branch of the Lenni Lenape, died in the neighborhood, at the Chester county almshouse, in the year 1803. The graves above described resemble, in many features, others opened near the Delaware Water Gap, a few years ago. The skeletons in the latter lay at a depth of two and a half to three feet and were extended from east to west, some of them being enclosed in rude stone coffins. The contents were also similar, consisting for the most part of objects of European manufacture. In Venango county also, in the vicinity of Franklin, a number of Indian tombs have been opened, in which were found remnants of fire-arms and copper and iron implements.

*Skeletons.*—The bones found in grave number one were much decayed, and consisted of skull, one humerus, both ilia, femora, tibiae and fibulae, besides some of the vertebral joints and finger bones with decayed fragments of ribs. The femur, allowing for the decay of the extremities, measured eighteen and a half inches in length, from the upper edge of the head to the base of the inner condyle. Grave number two produced, besides the cranium, a few of the long bones, very much decayed. The third grave contained simply the skull and some small fragments of bones. The fourth grave had evidently been exhumed at some previous time, as the few broken portions of bones it revealed were much displaced. About twenty-five years ago two of these tombs were opened in the night by a party of relic hunters, and in all probability this was one of those which had been disturbed.

*Crania.*—The following brief description of the skulls, taken from notes hastily jotted down in the field, will convey a general idea of their main characteristics, but I hope shortly to prepare a more exact description of them, as they are at the present moment not accessible to me. Skull number one is somewhat prognathous; teeth normal and excellently preserved, but the crowns, especially of the molars, are much worn by the use, probably, of maize. The general appearance and massiveness of the cranium would indicate that the subject was an adult male. Skull number two ex-

hibits a marked prognathism, though the superior maxillary was lost in its exhumation. The lower jaw is exceedingly massive, the teeth abnormal and number but eleven, the eruption of the last molar on either side having never occurred. The skull evidently belonged to a young warrior, and probably one of some celebrity, as the elaborate decoration of his grave would denote. Skull number three is probably that of a female. The walls are more fragile and show smoother surfaces than the former. Besides this, there was nothing of personal adornment found in the grave. This was the most perfectly preserved cranium of the series. The number of teeth in both jaws is complete. The skull is decidedly asymmetrical; viewed from above, the compression is seen to be on the right side, but this deformation is undoubtedly accidental. It presents a more orthognathous form than the two preceding.

The late Anders Retzius, of Stockholm, who devoted much attention to the study of the craniology of the American tribes, classes the Algonquins and Iroquois with the dolicocephali or long-heads. This point, however, cannot be satisfactorily determined until sufficient material be collected for more extensive measurements. The few Lenni Lenape skulls which have thus far been recovered, present such variable features that a general average of a large number must be obtained before we can arrive at any satisfactory results. There are some ethnologists who place the modern Indian tribes of America with the brachycephalic or short-headed class. It is exceedingly desirable, for the purpose of comparison, that every opportunity be embraced for obtaining and preserving the skulls of this tribe, as in a comparatively short time all traces of them will have irrevocably disappeared.

The discoveries in these graves go to prove that the inmates were among the last of their tribe who lingered on the banks of their dearly loved stream, ere the remnants of their people gathered themselves together and sadly wended their way westward. They had adopted, to a considerable extent, both in their manner of living and the disposal of their dead, the customs of the whites, with whom they had been thrown into contact for a number of years. The local legends and memories of the oldest inhabitants ascribe to these graves an age of about a century and a half, though some of them may be much more recent, as it is not probable that the entire number of interments were even approxi-

mately synchronal. We find that the method of inhumation practiced by this local clan or branch of the tribe did not differ materially from that of other divisions situated in other portions of the State. The bodies were generally extended at full length from east to west, sometimes encased in rude stone cists, but more frequently laid to rest with no covering except the vestments which had been worn in life. Occasionally, as we have seen, under the influence of civilization, the departed were encased in wooden coffins, furnished the tribe undoubtedly by their European neighbors.

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## NOTES ON SOME FISHES OF THE COAST OF CALIFORNIA. No. 1.

BY W. N. LOCKINGTON.

THE accompanying notes are chiefly the result of periodical visits paid to the markets of San Francisco during the months of October, November and December, with the object of ascertaining the comparative abundance of the various species, the localities where they are taken, their value as articles of food, etc., etc.

No attempt at classification is made, and in the generic names I have in most cases followed Günther, with whose works I am better acquainted than with those of Gill. *Sarda* is substituted for *Pelamys*, which is also the title of a genus of Hydrophoid snakes, and Prof. Jordan informs me that the snakes have a prior right to it.

The ichthyology of the Pacific coast of North America is as yet far from being fully worked out; in many cases there is considerable confusion of names, and little is known respecting the food, habits, spawning season, &c., of most of the species.

Several rare and some probably new fishes have been brought to the markets this year, principally because the fishermen use trawl-nets to a greater extent, and trawl to a greater depth than they were previously accustomed to do.

*Ambloplites interruptus* Grd. Sacramento River Perch.—This species is abundant along the lower course of the Sacramento and San Joaquin rivers, and in all the branches of those rivers that permeate the lowlands; and forms an important article of

food not only to the white inhabitants of the district, but also to the Chinese, who are particularly fond of it, catch it in immense numbers and forward it to their countrymen along the railroad as far as the boundary of the State, or even beyond it. It is usually taken in fyke-nets, which are most effective engines of destruction. It is occasionally brought to the markets of San Francisco, but has not been at all common there during the months of October, November and December. It is a very good fish for the table, unless taken in sloughs that by the falling of the water have become disconnected with the river.

*Anoplopoma fimbria* (Pallas) Ayres, Candle-fish.—This species is very rare in the markets of San Francisco, but appears to have been more abundant this year than at any previous period.

Dr. W. O. Ayres (Proc. Cal. Acad., 1859) states that in his time stragglers only occurred in the markets; and the fish-mongers call it a "new" fish, and declare they have never seen it before. Dr. Ayres gives the number of rays in the first dorsal as twenty-three, but I can only find twenty-one in the specimens I have examined. Probably the number varies slightly. The outline figure in the Proc. Cal. Ac. Vol. 1, 1859, shows twenty-two. The tail is much more deeply emarginate than is shown in the figure, as the central rays are only about half as long as the outer ones. Most of the individuals brought to the markets this year were not over ten inches in length, but Dr. Ayres states that he saw one that measured eighteen inches. The fishermen call this species candle-fish, but whether on account of its oiliness, of its length and slenderness, or of a fancied resemblance to the species called candle-fish in Oregon and northward I cannot tell. The last-named candle-fish (*Ammodytes personatus* Grd.) is not at all nearly related to the present species, but belongs to the *Ophidiidae*, a tribe approaching the eels in many particulars; it is so oily that it is said that the Indians make their candles by pulling their yarn through its flesh. Since October *A. fimbria* has not occurred in the markets, but it is not unlikely that the severe weather which prevents the fishermen from trawling is the cause of this.

*Ophiodon elongatus* Gir., Green Rock Cod.—This is one of the largest and commonest of our marketable fishes, frequently attaining a length of over three feet; and is usually in great part of a lively green color, spotted or clouded with light brown. But the coloration of the adults varies greatly, the brown markings sometimes

cover almost the entire fish, and different shades of brown occur in the same individual. The young is spotted with round spots of a light yellowish-brown, and it was to the young that the name *Ophiodon elongatus* was originally given by Girard, who described the adult with the title of *Oplopoma pantherinum*. *O. elongatus* was said to have a continuous dorsal with twenty-seven spines, and no membranous flap upon the forehead; while *Opl. pantherinum* was characterized by two separate dorsals, the first with twenty-five spines, and by the presence of a membranous flap,

Dr. Steindachner corrects this error (*Ichthyologische Beiträge*, No. III), and proves that the continuous dorsal and membranous flap are characters of the species.

The correct number of spines is twenty-seven, but the adult frequently comes to market in a dilapidated condition, with the spines torn apart from each other, or even broken away, and it is most probable that Girard described his *O. pantherinum* from such a mutilated specimen. Young and half grown individuals are common in the bay of San Francisco, but the larger examples are taken in tolerably deep water outside the bay, especially in the vicinity of the Farallones. A large individual that I measured as it lay upon the stall was three feet two inches long. Steindachner gives the range of this species as from Sitka to Monterey.

*Chirus constellatus* Grd., and *C. guttatus* Grd.—These species have been brought to market regularly, though not in great numbers, throughout the three months under review, and indeed appear to be always in season. Those brought to market are usually taken in the bay.

*Scorpenichthys marmoratus* Grd., the large red sculpin.—Despite the absence of scales upon its body, this species is commonly styled a rock cod. While its nearest relations, the smaller sculpins, or catfish, as they are often called here, are thrown away by the fishermen, this large sculpin is allowed a place among our food fishes. *A priori* one would expect the other sculpins to be good food, and I am assured by those who have tried them that they are; all they need is skinning before cooking.

*Sebastes fasciatus* Girard, clouded rock cod.—The name *fasciatus* is much less appropriate than Ayres's name of *nebulosus* (over which it appears to have the right of priority), since the broad light-yellow band which suggested the name is usually

absent, and the dark and light tints of the sides of the body are mingled together without any regularity. This is one of the smallest of the genus, but has been known to reach the weight of seven pounds.

*Sebastes nigrocinctus* Ayres, black-banded rock cod.—This is one of the rarest of our edible fishes, as only single individuals are brought to the market at considerable intervals of time. Only two specimens have hitherto come under my notice, and one of these has the black transverse bands much more developed than the other. It is not taken inside the bay.

*Sebastes rosaceus* Girard, smooth red rock cod.—This species appears to attain a larger size than any of its congeners except *S. ruber*, which it equals in length but not in weight, as it is more slender and seldom or never exceeds fourteen pounds in weight. *S. rosaceus* is taken outside the heads.

*Sebastes melanops* Girard, black rock cod.—This fish does not usually attain so large a size as *S. ruber* or *S. rosaceus*, at least in the locality where it is usually taken, viz: within the bay of San Francisco. It is one of the commonest kinds of rock-fish.

*Sebastes ruber* Ayres, rough red rock cod.—This, the largest of the genus occurring in our waters, is stated to reach, though rarely, a weight of twenty-five pounds. It is of a uniform bright red, very different from the brownish-red mingled with orange-red, which forms the livery of *S. rosaceus*. In form it is stouter than *S. rosaceus* but less so than *S. fasciatus*. It is taken outside the bay, usually from deep water around the Farallone islands. It occurs also northward at least as far as Humboldt bay.

*Sebastes auriculatus* Gir., black-shouldered rock cod.—This is rather a small species, seldom exceeding eighteen inches in length, and is brought to the markets in great abundance, probably on account of its common occurrence in the bay. Not only does this species occur, together with two or three others of the smaller kinds of *Sebastes* and the young of the larger kinds, in the deeper portions of the bay near the entrance, but it is also abundant along the eastern shore of the bay, where no other species of the genus is found, probably on account of the admixture of fresh water from the Sacramento river.

*Sebastes helvomaculatus* Ayres, pink-spotted rock cod.—This is smaller even than *S. fasciatus*, not equaling it in length and of much more slender form. The three elongated pink spots along

each side are constant, and at once distinguish it from every other species. In color it resembles *S. ruber*. Though not so common as *S. auriculatus*, or *S. melanops*, or even as *S. nebulosus*, *S. ruber* or *S. rosaceus*, it is occasionally brought in, in considerable numbers.

For all the above species of *Sebastes*, as well as for *S. flavidus* Ayres, *S. paucispinis* Grd., and *S. elongatus* Ayres, the fishermen have no other English names but rock cod or rock fish, although they can readily distinguish between the species. I have, therefore, coined names for them from their most obvious characteristics. All the species named, except *S. elongatus*, have occurred in the markets during the months of October, November and December. The names rock cod and rock fish are also applied to the various species of *Chirus*, to *Ophiodon elongatus* and even to the scaleless *Scorpenichthys marmoratus*.

*Sphyræna argentea* Grd., the barracuda.—It is well not to be misled by English names; that of *Barracuda* is applied not only to all the species of *Sphyræna*, of which there are several, but also to fishes of other families, and even other orders. In the rivers of South America the name is given to the *Sudis* (*Arapaima*) *gigas*, a soft-finned, large-scaled, fresh-water, carnivorous fish. All barracudás, however, are fierce, rapacious fishes, and the one we are at present considering attains a length of over three feet, and a weight of from twelve to fourteen pounds. The form is slender but it is nearly as thick as it is deep, and its jaws are armed with a formidable row of sharp teeth. When darting through the water it looks like a silver arrow. It is usually obtained south of the bay and at the Farallones, but occurs at least as far north as Tomales. Its flesh is very good eating, so that if it devours our food fishes, we may console ourselves by devouring it.

*Genyanemus lineatus* Gill, *Sciæna lineata* Günthr., the king-fish.—This species was formerly common in the bay, but since its waters have been defiled with so much tar and drain refuse by our destructive and imperfect civilization, it has become scarce, and is now usually obtained outside. It is, in my opinion, one of the most delicate of our food fishes.

*Sarda lineolata* Girard.—This, like all the Pacific coast Scombridae, is not very often brought to the markets of San Francisco, and is, therefore, a high-priced fish. Those that come here are caught in Monterey bay.



Günther (Cat. Fish. Brit. Mus., II, 368) considers this species to be identical with the *Pelamys chilensis* of Cuv. and Val. It attains a considerable size, a series of four specimens lying on the stalls in November of this year measuring respectively two feet two and a quarter inches, two feet two and three-quarter inches and two feet three and a half inches, from tip of snout to fork of caudal fin. The caudal fin cannot be said to be crescentic, as stated by Girard, since its posterior margin forms two sides of an obtuse isosceles triangle. The sides and belly are silvery, becoming bluish-black towards and on the back, and five or six obliquely longitudinal bands of the darker tint run along the sides.

*Scomber colias*, Spanish mackerel.—The *Scomber diego* described by Ayres (Proc. Cal. Ac., I, 1857, 92) has been proved by Steindachner to be identical with the long-known *S. colias* or Spanish mackerel of the European seas. Steindachner states that it occurs frequently on the coasts of the Galapagos islands, and wanders in small shoals along the Californian coast as far as San Diego, also that single individuals occur near San Francisco. I have never seen this fish in the markets, but the fishmongers appear to be acquainted with it. Thus this species and *Albula vulpes* are among the few fishes which inhabit both the Atlantic and the Pacific oceans.

*Stromateus simillimus* Ayres, pompano.—This species was first described by Dr. Ayres (Proc. Cal. Acad., Vol. II, p. 84, fig. on p. 85) in December, 1860, and accompanied by a good outline figure. Dr. Ayres states that in the course of seven years he only saw three or four specimens; but this year, at least, it is far more abundant, as I have seen as many as thirty or forty on the same stall on two or three occasions during October. As with the other Scomberoids, the examples brought to this market are caught in Monterey bay, which appears to form the northern limit of many species of fishes, crustacea and echinoderms.

As in the arrangement of the fishes in the Museum of the California Academy of Science, we are, at present, following the classification of Dr. A. Günther, of the British Museum, the name of this species must be changed from *Poronotus simillimus*, the title given it by Dr. Ayres, to *Stromateus simillimus*; as Dr. Günther admits no such genus as *Poronotus*, and it agrees with *Stromateus* in the entire absence of the ventral fins, short elevated form of body, and single long dorsal and anal fins.

The Italian fishermen call this species "pompino," and this must be accepted, in the absence of any other, as its English name. I am informed that a fish called "pompino," on the Atlantic coast, is considered to be the most delicate of all fishes; this is *Trachynotus carolinus*, a very different species. Our "pompino" is also highly prized as a delicate morsel, and is one of the dearest fishes in the market.

Mr. B. B. Redding has given me an account of a little practical joke in which the New Orleans species of pompino is concerned. When, during the civil war, Dr. Russell was in this country as correspondent, I believe, of the *Times*, he was so anxious to taste the celebrated pompino that he obtained leave to pass through the lines and visit New Orleans for the purpose. It happened, however, that pompino was not in season, but a perch of somewhat similar size and form, aided by the cookery of a clever negro cook, was passed off upon him as pompino. Dr. Russell ate, relished exceedingly, and wrote to his paper a glowing description of the gustatory delights of pompino, and it was not till some years after that it transpired that pompino was not then in season, and that he had been put off with perch.

*Mugil mexicanus* (?) Steind.—Several specimens of a species of Mugil, evidently very close to the above species, if not identical with it, have found their way to our markets in the months of September and October. All of them were taken near Santa Cruz, in the bay of Monterey.

The specimens examined agree with *M. mexicanus* in the number of scales in the lateral line, and of rays in the vertical fins, in the length of the latter, in the produced upper caudal lobe, and in the proportions of the body and head, and I should not hesitate to pronounce them to be of that species were it not that Mr. B. B. Redding, one of the Fish Commissioners for the State of California, has informed me that about three years ago he placed several (I believe about forty) individuals of a Mugil from the Sandwich islands in the Sacramento river, and it is, therefore, possible that the specimens obtained may be some of these, or their young. I suspect this because the shad introduced from the East, finds its way in considerable numbers to Monterey bay, instead of dutifully returning to the place of its birth, and this Mugil may have acted in a similar way; also because the specimens agree tolerably well with the diagnosis of *Mugil cephalotus*,

given by Günther. The inter-mandibular space agrees pretty well with Günther's figure of that of *M. cephalotus*, but it is still nearer to Steindachner's figure of *M. mexicanus*. As this is a mullet, it is of course tolerably good eating, but it must be remembered that it is not nearly related to those famous delicate fishes, the red mullet and the surmullet, which were so highly prized by the Romans that they fed them in aquaria, but to the gray mullet. The first-mentioned fishes belong to the *Mullidae*, and are provided with a barbel, the latter and our Californian fish to the *Mugilidae*, which has no barbel and no teeth worth speaking of.

*Brosmophycis marginatus* Ayres.—This is a very rare species, so much so that although it is taken in the bay of San Francisco, I have as yet seen only a single specimen, and Mr. Johnson, of the California market, whose practical knowledge of fishes can be safely relied upon, informs me that in the three years that have elapsed since he first noticed it, he has only seen three individuals. *Marginatus* is a very good name for the fish, as the long fin which encircles the greater half of the body, undivided into dorsal, anal and caudal fins, is of a vivid red in the fresh fish, and forms a most conspicuous margin. The exudation of mucus from the surface of the skin is most abundant, rapidly forming an epidermal covering, and it is therefore no wonder that my friend Mr. Johnson characterized it as a kind of eel. In thus naming it he was not so very far off after all, since the family *Ophidiidae*, to which it has been referred by Dr. Günther, is in many respects intermediate between the *Gadidae*, or cod tribe, in which it was originally placed by Dr. Ayres (under the name of *Brosmin marginatus*), and the *Murenidae*, or eel tribe. As it has hitherto had no English name, I venture to call it the red-fin, on account of its most obvious peculiarity. The family *Ophidiidae* contains some species of parasitic habits, vertebrates parasitic upon invertebrates, a strange inversion of our ordinary experience.

*Smelts*.—Several species of fish are commonly sold in this city under the collective name of "smelt." The species usually met with are *Atherinopsis californiensis* (Girard), *A. affinis* (Ayres), *Hypomesus olidus* (Pallas) Gill, and *O. smerus thaleichthys* (Ayres).

The two last of these are Salmonoids, and therefore have a right to the name of smelt, but the two former belong to a very

different family, the *Atherinidae*, and are said to be much less delicate in flavor than the others. A third *Atherinopsis*, *A. tenuis*, was described by Dr. Ayres (Proc. Cal. Ac. Sci., II, 75, fig. on p. 76) but it is very rare, and I have not yet seen it.

These fishes may be readily distinguished as follows: The two kinds of *Atherinopsis* have two dorsal fins, the first very small, placed about in the center of the length of the back, and formed of *spines* or stiff rays, the second rather larger, and separated by an interval from the first. Their prevailing color is light green.

The two Salmonoids have a dorsal fin, formed of *soft* rays, in or near the center of the dorsal outline, and a fleshy fold, or "adipose fin," placed farther back near the tail.

*Atherinopsis californiensis* is a larger fish than its congener, reaching a length of seventeen inches, and it may be distinguished by its larger head, more slender form of body, larger mouth and the central position of the first dorsal.

In *A. affinis* the dorsal is nearly its own length further back, the form of the body is much stouter, the head proportionally smaller, the mouth smaller, the fins larger and the flesh firmer. Dr. Ayres states that this species never exceeds eight inches in length, and this size must be but rarely attained, as the specimens I have seen in our markets seldom pass six inches, while *A. californiensis* usually exceeds twice that length.

*Osmerus thaleichthys* is really the nearest representative of the smelt of Europe, having the peculiar, pleasant smell that suggested the name in that species, which is also a kind of *Osmerus*.

It may readily be distinguished from the two previous species by the want of spinous rays on the back, by the adipose fin, by the absence of the bright green tint which is replaced on the back by a dull greenish-olive, on which a diamond pattern is traced by rows of minute dark dots that fringe each scale, and by its smaller size. From the other small Salmonoid it may easily be known by the comparatively large size of the mouth and less transparent appearance. It is usually from five to five and a half inches in length. Its form is stouter than that of *Hypomesus olidus*, the flesh is soft in texture, and the pectoral fins reach very nearly to the origin of the ventrals.

*Hypomesus olidus* (Pallas) Gill, is called "whitebait" by those who are familiar with the delicate fish known by that name in England, yet is not very nearly related to the real whitebait, which is asserted by Dr. Günther to be the young of the common

herring of the Atlantic. Its dimensions are about the same as those of the preceding species, but the mouth is very small, the end of the maxillary bone reaching only level with the front of the eye, while in *O. thaleichthys* it reaches to the back of the orbit. The head also is somewhat smaller. But this fish, when fresh, can be most readily distinguished by the transparency of its flesh, which, of course, disappears entirely in preserved specimens. The silvery band along the sides, which is found in all the four species, and is probably the cause of their being grouped together as smelts, is particularly bright in this fish.

I have not yet been able to ascertain at what season each of these species may be most common, but all are abundant in the markets throughout October, November and December.

*Albula vulpes* (*Albula conorhynchus* Günthr., Cat. Fish. Brit. Mus., VII, 468).—This widely distributed species has been found at various points along the Pacific coast of North America. Günther (Cat. Fish. Brit. Mus. VII, 469) mentions its occurrence on the coast of Central America; Steindachner (Sitz. Ak. Wiss. Wien., 1875, 61) incidentally states (in his description of *Mugil brasiliensis*) that it is found at San Diego; in the same year I received two specimens from Lower California, probably from Magdalena bay, as the fishes accompanying it came from that place; and lastly, in September, 1878, several specimens were brought to the markets of San Francisco. The fishmongers could not tell the exact locality from which these individuals were brought; but as few, if any, marine fishes find their way to our markets from points south of Monterey bay, and as that bay is frequented by many other fishes which are not found, except as stragglers, to the northward of it, I think it probable they came from thence.

The specimens from Magdalena bay (Lockt. Proc. Cal. Ac., 1876, 83) were most beautiful in their coloration, glowing with burnished silver below, deepening to gold upon the sides, and to darker metallic tints on the back; but those found in the markets this year were uniform silvery, as described by Günther.

By a typographical error in my Notes on Californian Marine Fishes (loc. cit., p. 84), the length of the example from Lower California is given as 3''·7 instead of 1'-3''·7. Those brought to market this year were only partly grown. The question arises whether the metallic colors are confined to the adults, or are the result of peculiarities in the environment.

## RECENT LITERATURE.

REPORT OF THE COMMITTEE OF THE HOUSE ON COINS, WEIGHTS AND MEASURES.—The late Congress has given the country abundant reasons for never wishing to see it again, but it remained for it to add as an appropriate headstone to mark its grave the above report. This committee was composed as follows: A. H. Stephens, Chairman; Levi Maish, Robt. B. Vance, J. B. Clark (Mo.), R. M. Knapp, H. L. Muldrow, J. B. Clarke (Ky.), M. S. Brewer, Thos. Ryan, J. W. Dwight, R. L. Gibson. To all appearance these gentlemen have embodied their views on the metrical system in a report of 234 pages. This report contains a collection of various works, reports, tables, &c., &c., from many sources, and in so far as the printing is accurate perhaps the labors of the committee have not been fruitless. But it is too evident that there has been no original thinking done by the committee on this important subject, nor do they seem to understand the contributions of others, while the form of the report is such as to make it appear that work done by others was done by the committee.

The introductory lines, which are doubtless original with the compiler of this report, are not, either in literary or statistical merit, up to the standard of what he has scissored. Thus we read, p. 6, that "Phidon of Argos in Greece, nearly a thousand years before the Christian era, gave the subject (?) his profound attention, but with no nearer approximation to what was wanting than any of his predecessors," &c.

The picture of Pheidon (?) of Argos profoundly attentive while far, far away from the desirable but missing, is touching. Poor Pheidon would have been reveling in the closest propinquity (at least by comparison) could he have only survived long enough to be placed in possession of this report.

The carelessness of this pot-pourri (or perhaps *ragout* would be more appropriate) is not only exhibited in the manner in which good pieces of work have been put together, but in the perpetuation of the radically wrong relation between the inch and the meter expressed by the number 39.370432, a number accepted by no persons on the globe except those directly influenced by the office of the United States Coast Survey.

Page 8, we read that "Some writer has said that the adoption of the Metric System in solving mathematical problems (?) in our public and private schools would save one full year's hard study in a boy's or girl's collegiate course."

Passing over the loose and only partly intelligible style of this statement, it is fair to presume that it grew out of "some writer's" ill remembrance of the following paragraph on the back of one of the Metric Bureau "Broadside's":

"The Hon. John Yates (an Englishman), after protracted inquiry and investigations in the schools and among those best able to

judge of the matter, reported that the complete adoption of the decimal, in place of the present English weights and measures, would save two full years in the school-life of every child educated. In our country the saving would be something less, because of our adoption of the decimal currency; but the most conservative teachers acknowledge that something like this amount of time would be saved each child if our present confusion of measures were entirely replaced by the International or Metric System."

It should be said in justice to the composer of this report that his English is no worse than that signed by seven distinguished names (p. 57), of which the following is a sample: "It is gratifying to know that the President of the United States, on having been consulted by Mr. Washburne upon the question of affixing his signature, was authorized by telegraph to do so, and signed the convention accordingly."

It was no doubt very kind of Mr. Washburne to permit the President to sign the convention, but who did Mr. Washburne represent?

We must conclude this hasty summary of the Report of the Committee on Coins, Weights and Measures, by drawing attention to the fact that the three tables published in Frazer's pamphlet on the "Proposed Substitution of the Metric for our own Weights and Measures," appear on p. 229 and the unnumbered following page of the report are without the slightest acknowledgment of the source whence they were taken.

This is the more remarkable in the table called "Distribution of English Units," because this is a photograph of a free hand diagram of Mr. Frazer, which was improved in the pamphlet above referred to. It contains a patent error (as here produced) in the line which leads up from the "Rod Pole or Perch" to a group with which this length has nothing to do. This error does not appear in the pamphlet printed in 1877.

We would sum up this report by saying that it illustrates but too forcibly some of the gravest defects in the present system of doing the work of our Government. The object which the committee endeavors to further is a good one, viz: the unification of weights and measures; but the M. C. of the last Congress could not bestow the time upon this question of pure statesmanship which its proper understanding requires, and it is but too clear that some underpaid clerk has been delegated by the members to make an indigestible salmagundi of all that has been done, with orders not to stop short of the two hundredth page. Thus more copy is afforded our merry Government presses, more disjointed thinking supplied for trunk linings and lamp lighters, while the committee may have the satisfaction of knowing that their Report is as unsatisfactory in favor of a good cause, as in the goldoid currency question it might have been fatally effective in a bad one.



As Mr. Culver, clerk to this committee, furnishes a short preface in which he speaks of the report as "compendious" and a "convenient book of reference," it is likely that he is responsible for it. None but the too partial eye of the editor could detect these qualities in a mosaic of which not a stone seems to have been fashioned to fit its place and all are put together without regard to form.

We have been informed that *only* 1200 copies of this report have been published, while 10,000 have been ordered by Congress. It is to be hoped that the other 8800 will not be issued until they have been completely revised and arranged so as to subserve some useful end, however small. At present the report may be compared to the last stanza in the "House that Jack built." Mr. Adams' (J. Q.) first report on the metric system representing the malt said to have lain in that house.

COUES'S BIRDS OF THE COLORADO VALLEY, PART I.<sup>1</sup>—Dr. Coues's writings on ornithological matters have become so well known both to specialists and the public at large, that the promised advent of a book from his pen is looked forward to with no ordinary degree of interest.

The present volume, "Birds of the Colorado Valley," may be regarded as complementary to the "Birds of the North-west," and when the work is finished, for we are promised a second volume in continuation, we shall have from our author what may be considered, collectively, as a very complete treatise, both technically and biographically, of the birds of our western interior.

The volume is introduced with a prefatory note by Prof. Hayden, in charge, in which is briefly given the scope of the work and a general description of the area treated of, with allusions to its ornithological facies in its broader aspects, together with a graceful mention of the several authors and workers in the same field whose writings and labors have been most largely drawn upon by the author.

The volume is divided into convenient chapters, each treating of a single family and beginning with a concise enumeration of the family characters. The genera or sub-genera are next characterized with sufficient amplitude for all practical purposes, when follows the treatment, in greater or less detail, of each species.

If it be permissible to compare the method of handling the subject adopted here with that of the companion octavo, which was, at the time of its appearance, regarded as so admirable, the present volume loses nothing by the comparison. On the contrary its literary execution appears to have received more care

<sup>1</sup> *Birds of the Colorado Valley*. A Repository of Scientific and Popular Information concerning North American Ornithology. By ELLIOTT COUES. Part I.—Passeres to Laniidæ. Seventy illustrations. 8vo, pp. xvi, 807. Washington Government Printing Office, 1878. Miscellaneous publications of the U. S. Geological Survey of the Territories, F. V. Hayden, U. S. Geologist-in-charge.

and to demand even higher praise, while the descriptions of all the species introduced, with the generally more thorough manner of treatment, gives to the present book a far wider sphere of usefulness.

It is rarely given to one individual to wield the pen of the exact scientific writer and, in addition, to possess the light touch, the facility of expression, the graceful humorous fancy—in short, the happy way of putting things—that so preëminently characterizes Dr. Coues' writings. It is due to this more than anything else that our author enjoys such a widespread popularity, since not only do such books as the present have an acknowledged value to the working ornithologist, but their popular element renders them acceptable to a large circle to whom ordinary ornithological treatises possess little or no interest.

We notice, in passing, in not a few instances that Dr. Coues has done good service in supplying vernacular names to birds hitherto christened in Latin, and in replacing inappropriate or positively objectionable appellations by others of his own coining. In most cases his selections are apt and well chosen. In others they cannot be so strongly endorsed, as, for instance, when he imports the term "Accentor" from the continent and applies it to our water thrushes. Its original application was to a group of birds of very different character, and hence the same argument against it applies that has very properly been given weight in other instances, as the robin, quail, partridge and others, which names, as attached to our birds have no proper significance, to say nothing of the fact that our bird's familiar name of water thrush is sufficiently appropriate and descriptive.

The use of Bartramian names in a number of instances will probably not find favor in the eyes of some ornithologists. But here there is ground for honest differences of opinion, and the discrimination for or against their use, at least in certain of them, must be left to the judgment of each writer.

Dr. Coues has especially laid the student of North American ornithology under heavy debt in two particulars, first in the synonymy, and second in the bibliography of the present volume. Just how much is meant by the statement of a personal verification and settlement of synonomical points and references, and the amount of labor involved in such a work will probably be appreciated by the few workers in the same field—and the paragraphs, amounting in certain instances to pages of fine type, which precede each description, will probably be passed over by the general reader entirely unnoticed, or with a mere glance of wonder as to their purpose.

The closet worker, however, will here find much matter to be grateful for, and in consequence of the thorough manner in which it is here presented, will be saved many an hour of painstaking search in musty and uninviting old volumes. The collection of

synonomical lists involves many nice points in the settlement of which it is hardly to be expected there will be an unanimous opinion among naturalists, especially when a question of such prime importance as to what does or does not constitute a species is left practically to each author's own judgment, and hence, not infrequently, its settlement becomes simply a presentment of individual opinions, or merely an exponent of the amount of material on hand for comparison. Here our author's power of research and fine critical ability is well displayed, and we think that in the main his conclusions rest upon safe ground.

In other cases we believe his views will bear scrutiny, and may cite, as a possible instance of hasty conclusion on the part of the author, his statement that the *Petrochelidon fulva*, of the West Indies, is scarcely, if at all, distinct from our *P. lunifrons*. We are glad to notice that he has left the matter open for future investigation and final settlement, as we feel sure that direct comparisons of specimens will show that the two are entirely distinct, even on the least conservative grounds.

But most important of all must be deemed the bibliographical appendix which is simply a brief extract of the Universal Bibliography of Ornithology, which is now in the author's hands well advanced towards completion.

The student must regret, of course, that within the present covers is not contained a full presentation of all North American titles, and that the present could not thus be made a monograph of this part of the subject. But if the line had to be drawn somewhere, he may congratulate himself that he has here access to so much as ninety-five per cent. of the whole amount, for so large a proportion as this, as the author states, is here represented. The missing five per cent. consist of all monographs, all general treatises on the birds of larger geographical areas, even if including North America, and all general works on ornithology.

We miss a few titles that appear to us should be present, even under the limitations drawn for himself by the author. Thus we do not find Grinnell's List of the Birds of the Yellowstone National Park in Capt. Ludlow's Report of the Chief of Engineer's, 1876, and Henshaw's Report on the Ornithological Specimens of the Wheeler Expedition for 1872, '73, '74, both quartos and of considerable importance, as well as some others. But these must be looked upon as omissions of but trifling importance when we consider the admirable fullness of this bibliography within its prescribed limits. We should not omit to mention that a most excellent index, almost, in fact, a bibliography by itself, renders reference to any desired title an easy and expeditious matter. The bibliography if finished with the same painstaking care so evident in this extract, must stand as a monument of critical labor and as a model for all future work in the same direction.

Glancing at the press-work it is evident that much care has

been taken with the proof-reading with the result that very few typographical errors appear. The printing of the first eleven chapters (nearly) upon tinted paper in strong contrast to the white of the remaining pages, from no fault of the printer as we understand, is to be regretted. The critical eye in search of faults might notice too, upon many pages, traces of old and worn type. But as a whole, and especially as regards its exterior dress, the appearance of the volume is neat and pleasing, and leaves little to be desired.

A government report might be supposed to be the last place to which one would turn in search of matter to while away an idle hour, but our author contrives to introduce into his pages many a bit of pleasant philosophy and many a tale of birds and their doings that will prove to the appreciative reader anything else but dry reading. Like the skillful cook whose art is shown by his power to serve a juicy dish, be the meat never so tough and unsavory, so the author's skill as a writer is seen in his ability to dress up bird histories, however commonplace the subjects, in a style that is sure to please. For a choice example of his peculiar knack, let us refer the reader to his story of the familiar cat-bird, where the author appears to us in his happiest vein of humor.

But space forbids even mention of all the good things that are brought together within these covers. Let each of our readers who loves a good book send for a copy, and we predict that few indeed will turn its leaves without finding something which will appeal to his or her interest.—*H. W. H.*

JENSEN'S TURBELLARIAN WORMS OF NORWAY.<sup>1</sup>—Our marine zoölogists will be interested in the appearance of this valuable work on the marine flat-worms of the Norwegian coast. A number of new forms are described in considerable detail, with excellent figures, while the descriptive portion is preceded by quite full anatomical details. The work is done in the careful, conscientious manner characteristic of Scandinavian zoölogists. The descriptions are both in Latin and Norwegian, so that the work is accessible to students in general.

MCCOOK'S NATURAL HISTORY OF THE AGRICULTURAL ANT OF TEXAS.<sup>2</sup>—For a number of years Rev. Mr. McCook, has been a diligent student of the habits of the ants of his own State, Pennsylvania, his papers appearing in the Proceedings of the Academy of Natural Sciences. The present volume is devoted to a single

<sup>1</sup> *Turbellaria ad Litora Norvegiæ occidentalia. Turbellarier ved Norges Vestkyst.* Al OLAF S. JENSEN, Conservator ved Bergens Museum. Mid 8 lithograferede tavler. Bergen, 1878. Folio, pp. 98.

<sup>2</sup> *The Natural History of the Agricultural Ant of Texas.* A Monograph of the Habits, Architecture and Structure of *Pogonomyrmex barbatus*. By HENRY CHRISTOPHER MCCOOK. Author's edition. Academy of Natural Sciences of Philadelphia. Anno Domini, 1879. 8vo, pp. 310. 24 lithographic plates.

species, the agricultural ant of Texas, to which the attention of naturalists had been drawn by the late Dr. Lincecum, of Texas. This ant is preëminent, as the author states, for its admirable social organization, its skill as a mason in excavating its vast and well ordered system of underground chambers; its extensive surface operations in clearing out circular court-yards to its nests, and road-ways to its foraging grounds; the striking variations in its surface architecture from cones to flat disks; its highly developed stinging powers, which place it among the most formidable of the stinging ants; while it is especially noteworthy from its harvesting habits. The results of the energy, skill and patience evinced in the study of this ant are most successful. There is an honesty of purpose, thoroughness in detail and general accuracy of statement, together with fullness of illustration in the cuts and the twenty-four lithographic plates, which will give a lasting value to the book as a biography of one of the most interesting of all animals.

We wish the author had given us his impressions as to the nature of the instinctive and rational acts of the ant, but we have here a store-house of generally well observed facts, which will afford material for the future student of animal psychology. The drawings are mostly by the author, and add greatly to the interest and attractiveness of the book.

WATERTON'S WANDERINGS IN SOUTH AMERICA.<sup>1</sup>—This quaint, at times somewhat affected narrative, whatever its drawbacks when judged by the standard works of scientific travelers, has always had a hold upon general readers. It is the journal of an English country gentleman possessed with a strong love of nature, a decided leaning to ornithology, a genius for taxidermy, and withal a patient and generally accurate observer. There are scattered through the volume sketches of animal nature which give it permanent value. While Waterton's adventures with the Cayman are credible, despite his contemporary critics, we have to thank him for the attractive and truthful pictures of tropical scenery and life. His sketches of the ant bear, the armadillo, the vampire, the ai or three-toed sloth, of certain birds, of the natives among whom he traveled, and his researches on wourali poison are all as valuable as they are entertaining. In his description of the sloth, Waterton makes a contribution to the subject of protective resemblance. "I observed," he writes, "when he was climbing he never used his arms both together, but first one and then the other, and so on alternately. There is a singularity in

<sup>1</sup> *Wanderings in South America, the north-west of the United States and the Antilles, in the years 1812, 1816, 1820 and 1824.* With original instructions for the perfect preservation of birds, etc., for cabinets of natural history. By CHARLES WATERTON, Esq. New edition, edited, with biographical introduction and explanatory index, by the Rev. J. G. WOOD. With one hundred illustrations. London, Macmillan & Co., 1878. 8vo, pp. 520. \$7.50.

his hair different from that of all other animals, and, I believe, hitherto unnoticed by naturalists; his hair is thick and coarse at the extremity, and gradually tapers to the root, where it becomes fine as a spider's web. His fur has so much the hue of the moss which grows on the branches of the trees, that it is very difficult to make him out when he is at rest."

The biography of Waterton by Rev. J. G. Wood, with its attractive illustrations, brings out well the characteristics of the hero of the narrative. The explanatory index by the editor occupies about one hundred and fifty pages, and has frequent illustrations. Taken altogether this edition is most attractive, and is a companion volume to Macmillan's elegant edition of White's *Selbourne*.

RECENT BOOKS AND PAMPHLETS.—The Devonian Brachiopoda of the Province of Pará, Brazil. By Charles Rathbun, late assistant geologist to the Geological Commission of Brazil, Prof. C. F. Hartt, chief. (From the Proceedings of the Boston Society of Natural History, xx, May 15, 1878.) 8vo, pp. 39.

Evidences of Cannibalism in an early race in Japan. By Edward S. Morse. (Reprinted from the Tokio Times, Jan. 18, 1879.) Tokio, Japan, 1879. 8vo, pp. 7.

Phryganiden-Studien. Von Fritz und Hermann Müller. (Kosmos II. Jahrg. Heft 11.) 8vo, pp. 386-396.

A Treatise on the Horse and his diseases, etc. By B. J. Kendall. Claremont, N. H., 1878. 12mo, pp. 89.

Crustacea Cunacea of the "Lightening," "Porcupine" and "Valorous" Expeditions. By the Rev. A. M. Norman. (From the Annals and Magazine of Natural History, Jan, 1879.) 8vo, pp. 19.

On *Loxosoma* and *Triticella*, genera of semi-parasitic Polyzoa in the British Seas. By the Rev. A. M. Norman. (From the Annals and Magazine of Natural History, Feb., 1879.) 8vo, pp. 7.

Geological Survey of New Jersey. Annual Report of the State Geologist for the year 1878. 8vo, pp. 131, with map. Trenton, N. J., 1878. From the author.

Fourteenth Annual Report of Rutgers Scientific School, the State College for the benefit of Agriculture and Mechanic Arts, New Brunswick, N. J., for the year 1878. 8vo, pp. 89. From the College.

A Synopsis of the American Firs (*Abies* Link). By Dr. George Engelmann. (Ext. from the Trans. Acad. of Sciences of St. Louis, Vol. III No. 4; read Dec. 17, 1877.) 8vo, pp. 10. St. Louis, Mo., 1878. From the author.

The Flowering of *Agave shawii*. By Dr. George Engelmann. (Ext. from Trans. Acad. Sciences, St. Louis, Vol. III, No. 4.) 8vo, pp. 4. with plate. (Nov., 1877.) From the author.

The American Junipers of the Section Sabina. By Dr. George Engelmann. (Ext. from Trans. Acad. Sciences, St. Louis, Vol. III, No. 4.) 8vo, pp. 10. (Nov., 1877.) From the author.

The Species of *Isoetes* of the Indian Territory. By Dr. G. Engelmann, St. Louis, Nov., 1877, with note by G. D. Butler, Almont, Iowa. (Ext. from Botan. Gaz. Vol. 3, No. 1, 1878.) From the author.

The Oaks of the United States (continuation). By Dr. George Engelmann. (Ext. from Trans. Acad. Sciences, St. Louis, Vol. III, No. 4, read Oct., 1877.) 8vo, pp. 21, with separate index. St. Louis, Nov., 1878. From the author.

The Annual Medical Directory of Regular Physicians in the State of Illinois, including all those who have complied with the law by registering in the office of the State Board of Health; for the year 1878. F. A. Emmons, M.D., editor. 8vo, pp. 112. Chicago, 1878. From the author.

Inscribed Stone of Grave Creek Mound. Report on—by M. C. Reid, of Hudson, Ohio, read at the meeting of the State Archaeological Society, held at Wooster, Ohio, Sept. 25, 1878. (Ext. Am. Antiquarian, Vol. 1, No. 3.) 8vo, pp. 139-149. From the author.

Note sur le bassin tertiaire de Bahna (Roumanie). Par M. Stephanesco. (Ext. du Bull. de la Soc. Geol. de France. 3e Série, to. v, pp. 387-293. Séance du 19 Mars, 1877.) 8vo, with plate. From the author.

Jura-Trias Section of South-eastern Idaho and Western Wyoming. By A. C. Peale, M.D. (Ext. from the Bull. of the U. S. Geol. and Geog. Surveys, Vol. v, No. 1.) 8vo, pp. 119-123. (Washington, Feb. 28, 1879.) From the author.

Classification of Coals. By Persifer Frazer, Jr., Philadelphia. (Ext. from Trans. Am. Inst. of Mining Engineers, Vol. VI, read at the Wilkesbarre meeting, May, 1877.) Author's edition, 1879. From the author.

On the Structure of the Gorilla. By Henry C. Chapman, M.D. (Ext. Proc. Acad. Nat. Sciences, Phila., 1878.) 8vo, pp. 385-394, pls. III-VI. From the author.

Fossil Forests of the Volcanic Tertiary Formations of the Yellowstone National Park. By W. H. Holmes. (Ext. from the Bull. of the U. S. Geol. and Geog. Survey, Vol. v, No. 1.) 8vo, pp. 125-132. (Washington, Feb. 28, 1879. From the author.

On the Association of Dwarf Crocodiles (*Nannosuchus* and *Theriosuchus pusillus*, e. g.), with the Diminutive Mammals of the Purbeck Shales. By Prof. Richard Owen, C.B., F.R.S., F.G.S. (Ext. from Quart. Journ. Geol. Soc., London, Feb., 1879.) 8vo, pp. 148-155, with plate. From the author.

A Catalogue of Official Reports upon Geological Surveys of the United States and Territories, and of British North America. By Frederick Prime, Jr., Assistant Geologist of Pennsylvania. 8vo, pp. 51. (Proof copy.) Philadelphia. March 15, 1879. From the author.

Catalogue of the Birds collected in Martinique, by Mr. Fred. A. Ober, for the Smithsonian Institution. By Geo. N. Lawrence. (Ext. Proc. U. S. National Museum.) 8vo, pp. 349-360. From the author.

Proceedings of the Academy of Natural Sciences of Philadelphia. Part III, 1878. 8vo, pp. 329-475, plf. III-VI. Philadelphia, 1879. And the same, pp. 9-24, of the volume for 1879. From the society.

Richthofen's Theory of the Loess, in the light of the Deposits of the Missouri. By J. E. Todd, of Tabor, Iowa. (Ext. from Proc. Am. Asso. Adv. of Science, Vol. XXVII. St. Louis meeting, Aug., 1878.) 8vo, pp. 10. From the author.

The Engineering and Mining Journal (Miniature copy). 12mo. No. 25 of Vol. XXVI. New York, Dec. 21, 1878. From the editor.

Boletín del Ministerio de Fomento de la Republica Mexicana. Folio (Daily) from March 13, to Feb. 20, 1879. From the Director of the Central Meteorological Observatory.

Proceedings of the National Academy of Sciences for 1878. 8vo, pp. 125-142. From the Academy.

Chesapeake Zoological Laboratory, Johns Hopkins University, Baltimore, Md. Scientific Results of the Session of 1878. (June 24th to Aug. 19th.) 8vo, pp. 190, pls. 13. Baltimore, John Murphy & Co., 1879. From the University.

Sur les Reptiles du temps primaires. Par M. Alb. Gaudry. (Ext. from Comptes Rendus de l'Académie des Sciences, 16 Decembre, 1878.) 4to, pp. 3. From the author.

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## GENERAL NOTES.

### BOTANY.

INSTINCT AND REASON, BY F. C. CLARK.—"Wonders of the vegetable world" never cease. Some of them are brought to light in the pages of the February number of the AMERICAN NATURALIST. "Leaves often change to roots, and roots in favorable



circumstances become leaves." "The plant \* \* \* for reproductive purposes has nettles, thorns, elastic films, as in the seed vessels of the squirting cucumber." "If the well-known sensitive plant be touched never so lightly, its flowers and leaves close." "The 'resurrection plant,' generally known as the Rose of Jericho \* \* \* to all appearance a mass of dry, dead vegetable fibre \* \* \* when sufficient moisture is applied it revives, its leaves expand, it is clothed in new verdure, and as its blossoms unfold, the reanimated plant is clothed in all its former beauty." "When night approaches flowers close their petals \* \* \* some plants, however, only flower at night. The beautiful *Yuccas* a species of wild lily, only blossom when the moon is out." The small leaflets of *Desmodium gyrans* "move up and down in alternate jerks, at the rate of sixty a minute. \* \* \* This motion is continued during all the seasons of the year, and during the whole life-time of the plant."

For all but one of these wonders the authority cited is "Wonders of the Vegetable World, by Schele DeVere." This book we believe to be a second edition of one entitled *A Salad for the Solitary*, which was noticed in the *American Journal of Science and the Arts* a good many years ago. It was then remarked that "Ignorance is not a sin *per se*, its heinousness depends on the use that is made of it." The following wonders, like that of the blooming of the *Yuccas* in moonlight, are more original, or at least more modern. In *Darlingtonia californica* "beautiful red wattles within the brim of its pitcher offer irresistible attractions to insects, especially to flies. These alight first upon the 'wattles,' then flying upward strike the pitcher, and owing to the peculiar twist of its walls falls to the bottom of the receptacle, where many another thoughtless fly has, too late, found its sepulchre." Why too late?

"Mrs. Treat has studied the habits of this plant (bladder wort, *Utricularia neglecta*), and learned that it allures animalcules by means of its bright flowers and leaves glistening with dew."

Some sentences are wondrous in other ways: *e. gr.* "For the removal of obstacles the plant has two courses, to disintegrate the object opposed to its progress, absorbing it if it be a suitable nutritive element, as are all animal and vegetable substances, and some minerals, or pass around it; or still again, as in extreme cases, to bury it up in its own substance, as are stones, bayonets, nails and the like."

Now a popular article, when it touches upon subjects of which the writer knows little or nothing, should be judged forbearingly when it goes wildly astray. In an ordinary magazine it would matter little, but in the pages of the *AMERICAN NATURALIST* these statements gain an importance and a currency which is not altogether pleasant. The undersigned does his duty in simply calling attention to the matter.—*Asa Gray.*

HENSLOW ON THE SELF-FERTILIZATION OF PLANTS.—The Rev. George Henslow concludes from his studies on the structure of plants, that the prevailing views as to the necessity of cross-fertilization are too extreme. He claims that "Mr. Darwin's works have gone too far to strengthen the belief that intercrossing is absolutely necessary for plants; and that if self-fertilization be continued for lengthened periods the plants tend to degenerate and thence to ultimate extinction. This I believe to be absolutely false." Mr. Henslow arrives at the following conclusions in his article in the *Popular Science Review*: "1. The majority of flowering plants can, and possibly do, fertilize themselves. 2. Very few plants are known to be physiologically self-sterile when the pollen of a flower is placed on the stigma of the same flower. 3. Several plants are known to be morphologically self-sterile in that the pollen cannot, without aid, reach the stigma, but is effective on that of the same flower. 4. Self-sterile plants from both the above causes can become self-fertile. 5. Highly self-fertile forms may arise under cultivation. 6. Special adaptations occur for self-fertilization."

CONTRACTION OF LEAVES OF SENSITIVE PLANTS.—In Sir J. D. Hooker's recent address as President of the Royal Society, it is stated that Dr. Burdon Sanderson has for two years past been studying the true relations between the electrical disturbances followed by the shutting of the leaf valves of *Dionæa*, and the latent change of protoplasm which precedes this operation. He has found that though the mechanism of the change of form of the excitable parenchyma which causes the contraction is entirely different from that of muscular contraction, yet that the correspondence between the exciting process in the animal tissues and what represents this in the plant tissues appears to be more complete the more carefully the comparison is made; and that whether the stimulus be mechanical, thermal, or electrical, its effects correspond in each case. Again, the excitation is propagated from the point of excitation to distant points in the order of their remoteness, and the degree to which the structure is excited depends upon its temperature. Notwithstanding, however, the striking analogies between the electrical properties of the cells of *Dionæa* and of muscle-cylinders, Dr. Burdon Sanderson is wholly unable to admit with Prof. Munk that these structures are in this respect comparable.

#### ZOÖLOGY.<sup>1</sup>

DISCOVERY OF MALE EELS.—We are glad to state that finally what we believe to be genuine male eels have been discovered. In the January number of this journal it was announced by Prof. Packard that he had discovered male eels. A number of the supposed males were afterward again examined, by Prof.

<sup>1</sup>The departments of Ornithology and Mammalogy are conducted by Dr. ELLIOTT COUES, U. S. A.

Packard and Dr. C. S. Minot, who were then led to conclude that the so-called male eels were immature females, and the mistake was corrected by Prof. Packard in the February *NATURALIST*. A large number of living eels were then examined by Messrs. Packard, Kingsley, Pierce and Minot without success, until at Prof. Packard's request Mr. Kingsley spent a few days at Wood's Holl, at the laboratory of the U. S. Fish Commission, in the last of February, examining living eels supplied by Mr. Vinal N. Edwards, by favor of Prof. Baird, U. S. Fish Commissioner. One hundred and ninety-three eels were there examined, and of these, three were found by Mr. Kingsley to be, in his opinion, males. His observations made on these living individuals, which were speared in a pond through the ice, are as follows:

"On February 18, 19 and 20, I examined one hundred and ninety-three eels, at Wood's Holl, and found three males, the testes of which agreed closely with Syrski's figures as reproduced in the U. S. Fish Commission Report for 1873-4 and 1874-5, p. 719. Although I made careful examination I could find no external characters to separate the sexes. The three males were each about seventeen inches long, while the females examined varied from about twelve inches to nearly three feet. This average length of males agrees closely with Syrski's (430 mm. in length). The principal criticisms I would make of his figures, or rather points of difference that I found, are that his enlarged figure showing the lobulation of the testis has the lobes far more crowded than they were in the specimens I examined. His drawing of the histological structure was greatly larger than what I supposed to be the same. His cells measure, according to the explanation, about  $\frac{1}{440}$  of an inch on their major axis, while I saw nothing that could have been over  $\frac{1}{4000}$  of an inch. The structure of the testis was similar to that which I have seen in the testes of the cod, perch, smelt, cat, deer, rooster, monkey, dog and man. On teasing it out under a Tolles one-fifth, I saw what I am confident were spermatozoa, although I could not distinguish the tails. The heads were oval and from one-half to one-third the size of those of the smelt, or about  $\frac{1}{20000}$  of an inch in length; they had an independent motion, changing their position on the slide without reference to any current in the water in which the tissue was placed, and this motion was wholly different in its character from the vibrations of the Brownian movement."

Prof. Packard examined independently of and in company with Mr. Kingsley, preparations made by himself, and found scattered through the tissues, nucleated and nucleolated testis cells, of the same appearance as those of the animals above named, which were kindly obtained by Prof. Pierce. Moreover, Prof. Packard found two mother-cells, containing several immature nucleated spermatozoa. So that after the examination of about five hundred female eels and three males, we are glad to be able to affirm

the entire accuracy of Syrski's observations and figures, he being the first observer, so far as we are aware, who has discovered the male sex of the Italian eel. Which species of eel it was that Syrski examined is not stated. In making these investigations we have to acknowledge the aid of Prof. John Pierce, of Providence, in the use of a fine series of mounted histological specimens and lenses of high powers. He has worked jointly with us and is of our opinion as to the sex of the three males. Dr. Minot examined one of the three males, preserved in alcohol, and found as Freud and Brock had done previously, a follicular structure, the follicles being filled with small spherical cells, which Dr. Minot considered to be probably immature spermatozoa, although the development could not be traced.—*A. S. Packard, Jr., and J. S. Kingsley.*

BREEDING HABITS OF THE DACE.—In the early part of June, 1878, an excellent opportunity offered itself for observing the breeding habits of the dace (*Rhinichthys atronasus*). Standing one afternoon upon one of the bridges crossing the river in this city, a nest of this fish was discovered in the stream below, it was about two feet in diameter, situated in running water from twelve to fifteen inches deep, and protected upon the upper side by a small root by which the current of the water was broken. The female would pass over the pebbles and deposit her spawn, while the male stood ready for an attack, and on the approach of an enemy would dart off like a flash in pursuit of the intruder. When no danger was near, and after the bed had been covered with spawn, the female would stand sentry until the male had passed over the eggs, and then both would proceed up the stream from four to ten feet or more, and taking a small pebble in their mouths, would quickly return and deposit them on the fecundated eggs, sometimes but one fish would go for pebbles, the other lingering near, thus layer after layer of impregnated eggs and pebbles were deposited one upon the other. These movements were watched for two days, when the water became muddy from the spring rains, and further observation was impossible. The wisdom displayed in these operations, and the wonderful exhibition of the instinct for the preservation of species is readily seen. The covering of the eggs retained them in their place, and at the same time protected them from being destroyed by other fishes who were constantly hovering about, like vultures watching an opportunity to devour them, while the interstices between the pebbles gave sufficient space to harbor the little fry, as soon as hatched, and to protect them until they, by their own instincts or by the assistance of the parent fish, were able to seek shelter beyond the reach of their enemies. I have no doubt in this manner all fresh-water *oviparous* fish deposit their spawn in (*not upon*) the pebble heaps we call their nests.—*W. H. Gregg, M.D., Elmira, N. Y.*

**LARGE RATTLESNAKES.**—Col. T. M. Bryan, of Vincenttown, N. J., writes us under date of Aug. 16th, that, "Rattlesnakes are very numerous with us just now, on account of the large amount of cedar swamp which is being cut. I obtained one which was six feet two inches long, with fourteen rattles and a button. Within the ensuing five days seven were offered, none, however, as long as the above mentioned, but one was five feet nine inches, and had fifteen rattles and a button."

**SOUND-PRODUCING ORGANS OF THE CRICKET.**—During some researches among the order of Orthoptera, made by me the past fall, I made it a point to carefully investigate the means by which the stridulous calls of the family Saltatoria were produced. Latreille, in the "Animal Kingdom" of Cuvier, says of this family of leapers: "The males call their females by making a chirping noise, which is sometimes produced by rubbing an inner part of the wing-covers like a talc-like mirror, against each other with rapidity, and sometimes by a similar alternate motion of the hind thighs against the wings and wing covers, the thighs acting the part of the bow of a violin." This description may be considered

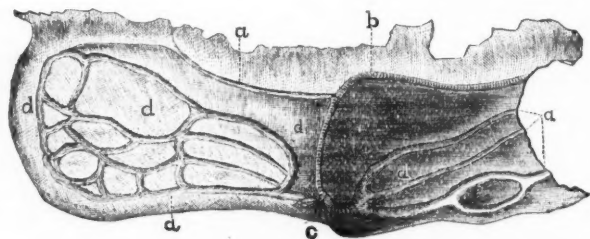


FIG. 1.—Enlarged view of the under side of the wing-case of cricket; *a*, tracheal tube; *b*, ridge bearing vibratory flanges; *c*, slight protuberance; *d*, coriaceous membrane.

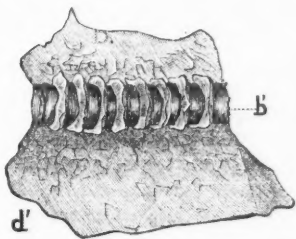
as relating more especially to the group in general, but in the case of the genus *Gryllus* (*Acheta* of English authors), of which I propose to speak, there is a special arrangement, a singular adaptation of means to ends.

It must be evident to all who are familiar with the notes produced by the cricket, that the extreme shrillness and penetrating power of their call could with difficulty be produced by the simple frictional movement of one unctuous "talc-like" surface over another. There are many different species the calls of which can be heard at the distance of several hundred feet, and one species, inhabiting Sicily (*G. megacephalus*) whose call has been distinguished at the distance of a mile.

This power to produce a penetrating tone, calls for a special

arrangement for that purpose. This arrangement we find on the under side of the wing-cases.

From a protuberance on the under-side of the coriaceous wing-case, about one-third the length of the case from its anterior extremity, and situated on the inner or sutural edge, there is a large tracheal tube which extends out laterally, thence forward and terminates at the juncture of the wing-case with the thorax. This tracheal tube forms, or extends through a ridge on the inferior surface of the case,



which is in the form of a quadrant or crescent. On the ridge is situated a series of minute transverse vibratory flanges, resting upon edge and resembling, to a certain extent, the scales of a fish when scraped so as to cause them to stand erect. The base of each flange is thickened, the upper edge slightly blunted and recurved. The upper surface of the wing-case is squamous, so that when either case is drawn over the other, the series of vibratory flanges on the under side of one is made to pass rapidly over the scaly upper surface of the underlying case, in this manner producing the harsh creaking sound so familiar. By a greater or less rapidity of motion the insect can produce the variations of tone which are often observed. As the cases do not unite in the center of the back but each passes nearly to the opposite side of the body, the chain of vibratory flanges can be utilized to nearly its full length, before it becomes necessary to re-commence the stroke.

When the ring-cases are at rest the two crescent shaped ridges are united so as to inclose a semicircular space in the center of the anterior portion of the cases. The leathery covering of this space is slightly elevated, forming a chamber underneath, which prevents the sound from being smothered in the folds of the second pair of wings, which lie directly beneath. The insect when about to produce its call usually assumes a fixed, statue-like position, with head lowered and posterior extremities slightly elevated, the cases forming an angle of twenty or thirty degrees with the abdomen.

The call is formed during the outward stroke of the cases, they being slightly separated when returning to the first position. I noticed that the field species, when calling from the mouth of its abode, stood with the head in the burrow and the extremities of the wings protruding from the opening, thus seeming to comprehend that their call could be heard to a greater distance if standing in this position than if in the reversed.

Fig. 2—*b'*, more enlarged view of the vibratory flanges; *d'*, scaly leather-like membrane.

I have examined the wing-cases of a number of species and find that they all have a like arrangement to the one here described, although the shape of the flanges may vary, to a certain extent.—*Newton B. Pierce.*

THE LECANIUM OF THE TULIP TREE.—On page 218 of the "Revised Manual," in speaking of other sources than flowers from which bees collect sweets, I remark that I have seen the bees thick about a large bark-louse, which attacks and often destroys one of our best honey-trees. This is an undescribed species of the genus *Lecanium*.

In the summer of 1870 this louse, which, so far as I know, has never yet been described, and for which I propose the name *Lecanium tulipiferae*—the *Lecanium* of the tulip tree—was very common on the tulip trees about the lawns of the Michigan Agricultural College, at Lansing. So destructive were they that some of the trees were killed outright, others were much injured, and had not the lice, for some unknown reason, ceased to thrive, we should soon have missed from our grounds one of our most attractive trees.

Since the date above given, I have received these insects from many of the States, especially those bordering the Ohio river. In Tennessee they seem very common, as they are often noticed in abundance on the fine stately tulip trees of that goodly State. In the South this tulip tree is called the poplar, which is very incorrect, as it is in no way related to the latter. The poplar belongs to the willow family; the tulip to the magnolia, which families are wide apart.

Wherever the tulip-tree lice have been observed, sucking the sap and vitality from the trees, there the bees have also been seen, lapping up a sweet juicy exudation which is secreted by the lice. In 1870 I observed that our tulip trees were alive with bees and wasps, even as late as August, though the trees are in blossom only in June. Examination showed that the exuding sweets from these lice were what attracted the bees. This was observed with some anxiety, as the secretion gives off a very nauseating odor.

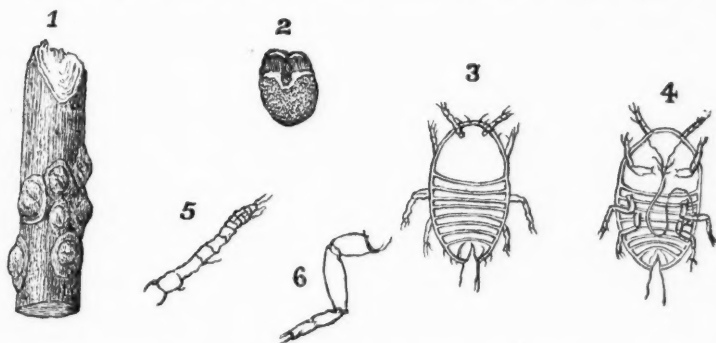
The oozing secretions from this and other lice, not only of the bark-louse family (Coccidæ), but of the plant-louse family (Aphidæ), are often referred to as honey-dew. Would it not be better to speak of these as insect secretions, and reserve the name honey-dew for sweet secretions from plants, other than those which come from the flowers?

The fully developed insect, like all bark lice, is in the form of a scale (Fig. 1), closely applied to the limb or twig on which it works. This insect, like most of its genus, is brown, very convex above (Fig. 1), and concave beneath (Fig. 2). On the under side is a cotton-like secretion, common to all of the genus *Lecanium*, which serves to enfold the eggs. Underneath the species in question are two transverse parallel lines of this white down (Fig.



2). One of them, probably the anterior, is nearly marginal, and is interrupted in the middle, while the other is nearly central, and in place of the interruption at the middle, it has a V-shaped projection back or away from the other line. The form of the scale is quadrangular, and not unlike that of a turtle (Fig. 1). When fully developed it is a little more than three-sixteenths of an inch long, and a little more than two-thirds as wide.

Here at Lansing, the small, yellow, oval eggs appear late in August. In Tennessee they would be found under the scales in their cotton wrappings many days earlier. The eggs are one-fortieth of an inch long, and one-sixty-fifth of an inch wide. These eggs, which are very numerous, hatch in the locality of



their development, and the young or larval lice, quite in contrast with their dried, inert, motionless parents, are spry and active. They are oval (Figs. 3 and 4), yellow, and one twenty-third of an inch long, and one-fortieth of an inch wide. The eyes, antennæ (Fig. 5) and legs (Fig. 6) are plainly visible when magnified thirty or forty diameters. The nine-jointed abdomen is deeply emarginate, or cut into posteriorly (Fig. 3), and on each side of this slit is a projecting stylet or hair (Figs. 3 and 4), while from between the eyes, on the under side of the head, extends the long recurved beak (Fig. 4). The larvæ soon leave the scales, crawl about the tree, and finally fasten by inserting their long slender beaks, when they so pump up the sap that they grow with surprising rapidity. In a few weeks their legs and antennæ disappear, and the scale-like form is assumed. In the following summer the scale is full-formed and the eggs are developed. Soon the scale, which is but the carcase of the once active louse, drops from the tree, and the work of destruction is left to the young lice, a responsibility which they seem quite ready to assume.

In my observations I have detected no males. Judging from others of the bark-lice, these probably possess wings, and will never assume the scale form, though Prof. P. R. Uhler writes me

that apterous males are found among the Coccidæ, and that in all cases the males are very important in the determination of genera.

*Remedies.*—If valued shade or honey trees are attacked by these insatiate destroyers, they could probably be saved by discrete pruning—cutting off the infected branches before serious injury was done, or by syringing the trees with a solution of whale-oil soap—or even common soft-soap would do—just as the young lice are leaving the scales. It would be still better to have the solution hot. Whitman's Fountain Pump is admirable for making such applications.

Fig. 1 is slightly magnified; the others are largely magnified. The drawings were made from the objects by W. S. Holdsworth, a senior of the Michigan Agricultural College.—*A. J. Cook.*

MOLTING OF THE HORNEDED TOAD (*Phrynosoma douglassi* Gray).—This well-known species of horned lizard, or horned toad as it is more commonly known, is very widely distributed over the north-western portion of the United States. It appears especially abundant throughout the Bad Lands, and over the dry country between the Yellowstone and Musselshell rivers. During my visit to those regions with the Yellowstone Expedition of 1873, about fifty specimens were collected for the purpose of studying some of their habits. The first were met with in the Bad Lands during the first week in July, where a number of young were obtained, having probably been born about the middle of June, as indicated by their size and condition. After the main body of the expedition had crossed the Yellowstone river, a temporary camp was established, when quite a number of adult specimens were obtained upon which we discovered the first signs of molting. Those which had been collected a few days before now began to show similar evidences of shedding the skin. At first, small dry vesicles made their appearance over the back and sides, running along the horizontal rows of pyramidal scales forming the margins of the abdomen. In a day or two the vesicles would break and desquamation began, which continued over a period of about eight or ten days, the cephalic spines and the claws being the last to adhere. Immediately after the old skin had been removed, the process of which I assisted in several instances as far as possible, the new surface presented quite a brilliant appearance when closely viewed. The darker markings upon the dorsum appeared minutely sprinkled with black and brick red, while the lighter portions remained a pure olive of various shades.

After molting, the intensity of coloration is gradually lost, as the skin becomes more ashy or dusky, returning to the natural hue which the specimen bore previous to molting.

The specimens as far as observed, went through the process of molting from three to four weeks after the birth of the young. Mr. H. W. Henshaw (Surveys west of 100th meridian) has

observed the change, but from his observation he thought it occurred during the breeding season.

The specimens found on the prairie region flanking the Yellowstone river, were very light in color; those from the Bad Lands somewhat darker, while those obtained near, and on the Mussel-shell river were extremely dark, and one specimen was nearly black. In this individual the abdomen was darker than the backs of the specimens from the prairie districts. The abdominal scales were densely covered with black spray, sufficiently so as to give some of them a uniform color.

Dr. Yarrow<sup>1</sup> and Mr. Henshaw both say the coloration of the animal depends greatly upon the color of the soil where found, and this has been the result of my observations in Dakota and Montana, as well as in Arizona among other species of the same genus.

Dr. Yarrow<sup>2</sup> in speaking of the time that these reptiles may be kept alive without food, says he has never been able to keep them alive over four months. Of the total number collected in 1873, I brought sixteen to Pennsylvania, five of which survived until the following May. The state of torpidity which began in December may account for this to some extent, but at various times during the winter of 1873-4, I placed them near the heater to revive them temporarily for the purpose of showing them to inquisitive visitors; still this did not apparently affect them. In May, 1874, I placed them in the garden, and soon after being exposed to the sun they showed signs of exhaustion, difficulty of respiration, and finally died. They were considerably emaciated, and probably the state of debility, in addition to a humid atmosphere and sudden exposure to the hot rays of the sun was too much for them.—*W. F. Hoffman, M.D.*

#### ANTHROPOLOGY.<sup>3</sup>

PERFORATED SKULLS.—Rev. Stephen Bowers, Ph.D., recently discovered a burial place near Santa Barbara, Cal., which he explored in part. It yielded thirty or forty skeletons, serpentine bowls, a pipe, arrow-head, shell and bone ornaments, beads, etc. But the most singular feature was a nest of six skulls entirely separated from the other portions of the body, and buried under boulders and fragmental rocks; five of these skulls were perforated near the apex (with one exception); the perforations were about three-fourths of an inch in diameter, and were doubtless made at death. He found other perforated skulls in the same cemeteries, but they were in too friable a condition for preservation.

ETHNOLOGY OF SOUTHERN CALIFORNIA.—Dr. Bowers spent several months during the year 1878 in ethnological explorations

<sup>1</sup> Bull. U. S. Geol. and Geog. Survey, IV, 1878, p. 286.

<sup>2</sup> Ibid, p. 287.

<sup>3</sup> Edited by Prof. OTIS T. MASON, Columbian College, Washington, D. C.

in Southern California. His work was chiefly confined to Santa Barbara county and portions of San Luis Obispo and Ventura counties. The regions of the Santa Inez, Santa Maria, Arroyo Grande, Ventura and Santa Clara rivers, and some of their tributaries, were examined, and the sites of old pueblos mapped. In the collections made, and the study of the remains of the nearly or quite extinct Santa Barbara stock, much additional light has been thrown on their hitherto scanty history. A remarkable feature, of Mr. Bower's discoveries in the burial places of this race is that he has found exact duplicates of the stone implements figured in Dr. Schliemann's Mycenæ. Mr. Bowers is preparing an exhaustive monograph of his interesting discoveries, which will be published by the Department of the Interior.

CRANIA AS CINERARY URNS IN THE MOUNDS OF OHIO.—An article in the *NATURALIST* for November, 1878, by Mr. Henry Gilman, on the utilization of crania as cinerary urns, calls to mind what is probably a parallel case, which recently came under the writer's observation in this vicinity.

In this instance the mound, which was opened under the direction of Dr. Charles L. Metz, of Madisonville, was composed of a light sandy loam like the surrounding soil, but had received an additional layer of yellow clay, ranging from six to twelve inches in thickness. Its measurements are, approximately, as follows: Circumference 200 feet, height 7 feet. It is situated on the "second bottom" or plateau of the Little Miami river, about one hundred and fifty feet above the water line, and distant about one-third of a mile from the river. A trench four feet in width and as deep, apparently, as the original surface, was carried to its center from opposite sides, but without at first finding anything to indicate the former presence of man. Continuing a little deeper, however, almost directly in the center, there was found a small, circumscribed deposit of ashes mixed with fragments of charcoal and charred bones, about three or four handfuls in all; with these were mingled pieces of a human skull in perfectly sound condition so far as the action of fire was concerned, but very soft and friable through decay. They regained their hardness to some extent after being dried by exposure to the air.<sup>1</sup>—*Frank W. Langdon, Madisonville, Ohio.*

ANTHROPOLOGICAL NEWS.—The *Journal* of the Anthropological Institute, Vol. VIII, No. 2, for November, 1878, contains a cluster of very important papers. Mr. W. Flinders Petrie discusses the vexed question of Metrology and Geometry in Ancient Remains. Two things seem to be certain upon this subject: all builders of

<sup>1</sup> For further information concerning the earthworks, etc., of this vicinity, see "Pre-historic Monuments of the Little Miami valley," with Chart, by Charles L. Metz, M.D. *Journal of the Cincinnati Society of Natural History*, Vol. 1, No. 3, October, 1878. The mound here mentioned is No. 6, Group A, and has been opened since the publication of the article referred to.

permanent works have had a standard, and it is very difficult to ascertain what that standard was. Mr. Petrie finds a strong resemblance between the unit of the North American mound-builders and some of the old world standards.

The next paper on the game of Patolli, in Ancient Mexico, and its probable Asiatic origin, by Mr. E. B. Tylor, has already appeared in the *Popular Science Monthly*. The paper by Mr. Francis Galton on Composite Portraits was read last summer before the British Association, and was fully noticed at the time. The next communication, on the Origin of the classificatory system of relationship used among primitive peoples, by Mr. C. Staniland Wake, occupies 36 pages, and is chiefly a review of Mr. Lewis H. Morgan, Sir John Lubbock and Mr. McLennan, and opposes Mr. Morgan's hypothesis of the consanguine family and promiscuity as the starting point of his system. Mr. Wake affirms that "the consanguine family has not existed as a recognized social institution," and that "the Punaluan group can be accounted for satisfactorily without assuming the prior existence of the consanguine family." Against Sir John Lubbock's theory that "Children were not in the earliest times regarded as equally related to their father and their mother, but that the natural progress of ideas is, first, that a child is related to his tribe generally, secondly, to his mother and not to his father, thirdly, to his father and not to his mother, lastly, and lastly only, that he is related to both," Mr. Wake offers the opposing statements of Mr. Morgan with reference to our own American tribes. Mr. McLennan's system of polyandry is dismissed with a few words.

The number closes with two papers, by Mr. Alfred Simson, on South American tribes, entitled: "Notes on the Piojes of the Putumayo," and "Vocabulary of the Zaparo language."

All lovers of excellent work will be delighted with a new serial whose first number appeared Jan. 31, 1879, bearing the following title, *Index Medicus*, a Monthly classified record of the Current Medical Literature of the World. Compiled under the supervision of Dr. John S. Billings, Surgeon U. S. Army, and Dr. Robert Fletcher, M.R.C.S., Eng. New York, F. Leypoldt, 37 Park Row. We take the liberty to quote from page 31 the following titles:

Busch (H.) Grösse, Gewicht und Brustumfang von Soldaten. Studien über ihre Entwicklung und ihren Einfluss auf die militärische Tauglichkeit. Berlin, 1878, A. Hirschwald. 85 pp., 8vo.

Cassanova (A.) Ibridismo in ispecie fra l'uomo e parecchi animali, facendo punto sulla trasformazione delle razze scimiotiche di primo ordine nelle infime selvaggie umane, e sui metodi per ottenere migliori tipi umani, equini, boviné, ovine, ecc. Milano, 1878. Zanaboni, 228 pp., 8vo, 51.

Von Lenhossék (Jos.) Des déformations artificielles du crâne en général, de celles de deux crânes macrocéphales trouvés en

Hongrie et d'un crâne provenant des temps barbares du meme pays. Avec 11 fig. phototyp. sur 3 planches, 11 fig. xylogr. et 5 fig. zincogr. intercalées dans le texte. Budapest, 1878, Kilian, 134 pp. gr. 4. m. 18.

Montano. Etude sur les crânes boughis et dayaks du Museum d'histoire naturelle. Avec projections au diaporama intercalées dans le texte. Paris, 1878, G. Masson. 71 pp., 8vo.

Schoebel (C.). L'âme humaine au point de vue de la science ethnographique; suivi d'une note sur Claude Bernard et son principe du critérium ethnographique. Paris, 1878, De Rosny. 24 pp., 8vo.

Bouchut (E.). Peso de los recien nacedos. Rev. de med. y cir. práct., Madrid, 1878, II, 289-300.

Davreux. Un cas remarquable de microcéphalie. Ann. Soc. Med.—Chir. de Liege 1879, XVII, 329-331.

Dupouy. De l'hérédité et des mariages consanguins. Médecin, Par., 1878, IV (No. 40).

Whitley (N.). Is "palæolithic man" a reality of the past, or a myth of the present? Jour. of Psych. Med., London, 1878, n. s. IV, 256-275.

In addition to the foregoing valuable list from *Index Medicus*, the following brief references are given with the hope that they may be of service to some of our readers:

A review of non-Biblical Semitic literature for 1878, by A. Neubauer, in *Athenæum*, Jan. 11.—The Aryan Household: an Introduction to comparative jurisprudence, by William E. Hearn, reviewed in *Athenæum*, Jan. 25.—The History of Afghanistan from the earliest period to the outbreak of the war in 1878, by Col. G. B. Matteson, reviewed in *Academy*, Jan. 11.—Russian and Turk, from a geographical, ethnological and historical point of view, by R. G. Latham, reviewed in *Academy*, Jan. 18th, by M. Elie Reclus.—Discoveries of Antiquities in Italy in 1878, by F. Barnabei, reviewed in *Academy*, Jan. 18, 1879.—Prehistoric Copper Implements. An open letter to the Historical Society of Wisconsin, by Rev. E. F. Slater, *New England Hist. and Gen. Register*, Jan. 9, 9 pp.—Ancient Artificial Mounds, B. Shipp, *Louisville Magazine*, Jan., 7 pp.—Peruvian Antiquities, Dr. E. R. Heath, *Quarterly Journal of Science*, Jan.—Fairy Lore of Savages, J. A. Farrer, *Saturday Magazine*, Jan. 4, 8 pp.—The Indian as a coming citizen, by E. B., *Lippincott's Magazine*, Jan., 2 pp.

#### GEOLOGY AND PALÆONTOLOGY.

GEOLOGICAL SURVEY OF NEW ZEALAND.—The following districts of New Zealand have been geologized during the season 1877-8: The Hokanui mountains in Southland, by Mr. Cox, from October to January, assisted by Mr. McKay, who continued the work of collecting fossils until the end of February. In January Mr. Cox visited and reported on the copper lode at Dusky sound.

He was then occupied until March in the examination of the Te Anau Lake district, after which he made the required inspection of the various coal mines. Mr. McKay was employed on the east coast of the Wellington district during September, in the Mount Potts district of Canterbury in October, and in the Wairoa and Dun Mountain district of Nelson in May. Lastly, the D'Urville island copper lodes were examined by Mr. Cox in August.

During the year twenty-six out of the thirty-two collieries now in work in the Colony were inspected and surveyed, and all the working plans brought up to date. The underground surveys were made in the first instance by Mr. Denniston, the government coal viewer, and afterwards, in most cases, inspected and passed by Mr. Cox, who holds the position of inspector under the "Regulation of Mines Act, 1874."

The following is a list of the collieries, with the date of the last inspection of each, and the yield of each year, for the year ending on 30th June:

<i>District.</i>	<i>Date of inspection.</i>	<i>Output for past year in tons.</i>
<i>Malvern Hills—</i>		
1. Canterbury colliery.....	1st November, 1877.....	1,000
2. Wallsend ".....	3d February, 1878.....	1,462
3. Springfield ".....	26th October, 1877.....	1,435
4. Stevenson ".....	19th October, 1877.....	
5. Homebush ".....	13th October, 1877.....	2,235
<i>Oamaru District—</i>		
6. St. Andrew's colliery.....	10th November, 1877.....	50
7. Prince Alfred ".....	14th November, 1877.....	2,045
8. Awamoko ".....	16th November, 1877.....	400
<i>Otago Coal Fields—</i>		
9. Real Mackay colliery.....	11th and 22d January, 1878.....	306
10. Bruce ".....	11th and 19th January, 1878.....	1,583
11. No. 1 Kaitangata ".....	10th Dec., 1877, and 9th Jan., 1878.....	1,872
12. Kaitangata Coal Mining Co.....	5th Dec., 1877, and 9th Jan., 1878.....	10,477
13. Shag Point colliery.....	27th November, 1877.....	2,622
14. Otago ".....	June, 1877.....	2,941
15. Freeman's ".....	June, 1877, and 7th January, 1878.....	5,006
16. Walton Park ".....	June, 1877, and 7th January, 1878.....	16,000
17. Samson's ".....	June, 1877, and 7th January, 1878.....	8,000
18. Saddle Hill ".....	June, 1877, and 8th January, 1878.....	4,000
19. Lawrence ".....	3d June, 1878.....	1,351
<i>Greymouth District—</i>		
20. Wallsend colliery.....	25th February, 1878.....	440
21. Coal-pit Heath colliery.....	20th February, 1878.....	6,138
22. Brunner ".....	22d February, 1878.....	21,974
<i>Reefton District—</i>		
23. Energetic colliery.....	15th March, 1878.....	500
<i>Buller District—</i>		
24. Wellington colliery.....	2d March, 1878.....	948
<i>Collingwood District—</i>		
25. Parapara colliery.....	31st March, 1878. Closed.....	
<i>Auckland District—</i>		
26. Miranda colliery.....	January, 1877.....	600
27. Taupiri ".....	February, 1877.....	
28. Kupakupa ".....	February, 1877.....	5,200
29. Waikato Coal Co.....	(Not yet visited.).....	600



*Whangarei—*

30. Whauwhau colliery.....	10th March, 1877 (estimate).....	2,000
31. Kamo ".....	March, 1877.....	1,200

*Bay of Islands—*

32. Kawakawa colliery.....	April, 1877.....	36,599
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Total output for Colony..... 138,984

—*Jas. Hector.*

THE AMYZON TERTIARY BEDS.—In Vol. I of the Report of the United States Geological Survey of the Fortieth parallel, page 393, the able author, Mr. King, has described an extensive series of beds, including many laminated shales, which are found in the northern part of Nevada, as constituting an extension of the Green river formation west of the Wasatch mountains.<sup>1</sup> He states that they contain the same species of fossil fishes as those of the Green river epoch. I published the first notice of this formation, which I examined at Osino and at Elko, Nevada,<sup>2</sup> and described from it two species of fishes, which were referred to genera previously unknown, viz: *Amyzon* and *Trichophanes*. These genera have not been found represented in the fish fauna preserved in the Green river shales, which embraces eight genera and twenty-four species. But they occur in several species and specimens in the South park of the Rocky mountains of Colorado, associated with the genera *Rhincastes* and *Amia*, neither of which has yet been found in the Green river formation. The first named is common in the Bridger, but in a different form, and the generic identity is not yet fully established. The *Amia* is represented in the Bridger by *Pappichthys*, but in the former the characteristic parts have not yet been seen in the South park specimens, so that here also the determination of the genus is not final. It, however remains, that this fish fauna is different from that of the Green river beds, and the modern aspect of the genera points to an age even later than the Bridger. It is evident that the pertinence of this series of rocks to the Green river formation, asserted by King, cannot be maintained. I have named this epoch that of the Amyzon beds, from the characteristic genus which it includes, and refer it to the later Eocene or early Miocene eras. Its fish fauna includes ten species, distributed as follows: *Trichophanes* Cope, 3 sp.; *Amyzon* Cope, 4 sp.; *Rhincastes* Cope, 1 sp.; *Amia* L., 2 sp.—E. D. Cope.

GAUDRY ON PERMIAN VERTEBRATA. — Prof. Gaudry recently brought before the Academy of Science descriptions of several interesting types of *Batrachia* and *Reptilia* from the Permian of the Department of the Saone et Loire. Among these was *Actinodon* Gaudry, whose vertebræ are segmented so as to closely resemble those of *Rachitomus* (this journal, 1878). Another form allied to *Protriton*, was probably a terrestrial animal, and possessed

<sup>1</sup> L. c. I, p. 393.

<sup>2</sup> Proceedings Amer. Philosophical Soc., 1872, p. 478.

a large tail; it was termed *Pleuronura pelliati*. The third type was represented by a humerus which resembles that of the *Dime-trodon* of Texas, and similar forms from the Ural and South Africa, in presenting some Mammalian features. He referred it to a new genus, under the name of *Euchyrosaurus*, which is probably Pelycosaurian.

A STING RAY FROM THE GREEN RIVER SHALES OF WYOMING.—Leslie A. Lee, of Bowdoin College, Me., recently lent me for examination an interesting fossil from the above formation, from the locality which has recently furnished such fine specimens of *Mioplosus*, *Diplomystus*, etc. It is a species of sting ray nearly allied to the genus *Trygon*, but so far different as to be referable to another genus which I propose to name *Xiphotrygon*. Its characters are: teeth with produced triangular crowns as in *Raja*. Caudal spines compressed, with a single serrate-edge, which is dorsal. No caudal fins discoverable. The species has a rather long acuminate snout without superficial ossification, from whose apex the pectoral fin borders diverge. The latter do not extend posterior to the ventrals. Tail very long and slender, nearly twice as long as head and abdomen. Caudal spines (three present in the specimen) with a shallow lateral groove, but otherwise smooth. Pectoral rays  $31 + 10 + 41$ . Total length m. .515; width at middle of abdomen .230; length of head .100; length of tail .351; length of spine .040. The species may be called *Xiphotrygon acutidens*. The *Trygon muricata*, of Monte Bolca, has the typical form of spine, according to Gazzola —E. D. Cope.

AMERICAN ACERATHERIA.—Four species of rhinoceroses have been found within the limits of the United States, which may be referred to the above genus. They are, commencing with the smallest, *A. mite* Cope, *A. occidentale* Leidy, *A. pacificum* Leidy (= *A. ? hesperius* Leidy, from Oregon) and *A. truquianum* Cope, n. sp., from the John Day river deposit of Oregon. The last named is the largest American species, nearly equaling the *Aphelops megalodus* of the Loup River formation. It is only known from an incomplete mandible, which supports molar, canine and incisor teeth. The former have the usual form. The crowns of the canines are considerably wider than those of the incisors, but do not project very far beyond them. They are sub-triangular in outline, having a prominent shoulder at the base on the inner side. There is but one incisor on each side, which has a transverse crown. Diastema long; ascending ramus vertical, flat in front. Depth of ramus at last molar. 065; length of last molar .045; width of do. .029; length of crown of canine .027; width do. at base .024.

From beds of the Truckee epoch of the White River formation. This name, introduced by King, has priority of publication over the term Oregon beds introduced by me, hence the latter must be abandoned.

I add that the genus *Aphelops* differs from *Aceratherium* in the presence of but three toes on the anterior foot, and from *Rhinoceros* in the absence of horn.—*E. D. Cope*.

THE LOWER JAW OF LOXOLOPHODON.—Messrs. Speir and Osborn contributed to the April number of the *American Journal of Science and Art*, a very interesting account of the mandible of *Loxolophodon cornutus*, which has been hitherto unknown. It presents characters as curious as those of the cranium. The incisors and canines are similar, and have remarkable bilobate crowns, and there is a slight expansion of the lower margin of the ramus to represent the wide phlange of *Uintatherium*. The authors of the paper have not consulted the literature as carefully as they might have done, and have thus been led into error in several points. They think that the mandible of *Loxolophodon* had been already described by me, and that erroneously; whereas the description to which they refer, is that of another species, probably of another genus, found in a different Bridger basin. It was not identified, and was described only as "resembling that of *Uintatherium*." They confirm my description of the furcate character of the premaxillary bones, while seeming to disapprove of it. They also appear to suppose that the question of the possession of a proboscis is identical with the question of Proboscidian affinity, which are really dissimilar propositions.—*E. D. Cope*.

#### GEOGRAPHY AND TRAVELS.<sup>1</sup>

AFRICAN EXPLORATION.—Dr. Rohlfs left Tripolis about Christmas. Letters dated January 27, 1879, at Sokna, some 250 miles south of Tripolis, have been received, from him, at Berlin. They include a valuable zoölogical report by Dr. Stöcker and a number of astronomical observations. Sultan Ali of Wadai, who treated Dr. Nachtigal so hospitably, is dead, but his brother, Jousouf, who succeeded him, is said to be equally well disposed towards foreigners.

Capt. Roudaire reports favorably on the experimental borings made by him along the neck of land separating the gulf of Gabes from the Saharan depression. Nothing but sand and soft soil were encountered down to a depth of one hundred feet. There are no rocks, and M. de Lesseps expresses himself satisfied that the construction of a canal will meet with no difficulties. The scheme, however, of converting this portion of the Southern Sahara into an inland sea is severely criticized; it is said that, if successful, it would destroy the date-culture, and owing to the prevalence of northerly winds would not exercise any favorable influence upon the climate of Algeria.

Mr. Mackenzie, the African traveler, sailed from England recently for Cape Juby, on the north-west coast of Africa, in a

<sup>1</sup> Edited by ELLIS H. YARNALL, Philadelphia.

specially chartered steamer, for the purpose of opening that region to commerce.

M. Paul Soleillet, according to the last intelligence received in Paris, had reached Sego and was proceeding onwards.

One of the most important explorations recently accomplished is that of the river Ogowé, the largest river in the French colony of the Gaboon. This expedition, commanded by M. Savorgnan de Brazza assisted by Dr. Ballay, has now returned after three years of hardship and danger, having had to struggle against the ill-will and cupidity, and eventually the open hostility, of the natives. The Ogowé may be divided into three almost equal parts, the upper, middle and lower. The middle portion follows the equator as nearly as possible, and the other two incline about a degree and a half southwards, the one towards the source and the other towards the mouth. MM. de Brazza and Ballay started from Lambaréné, the extreme limit of the European factories, in August, 1875. They halted first at Lopé, a large village on the middle course of the river, whence M. de Brazza went by land into the country of the Fans, who were friendly, and from thence to Doumé, much higher up the river, where he was rejoined by Dr. Ballay. Above the Poubara falls the Ogowé becomes an insignificant stream. Having ascertained that it did not communicate with the great lakes in the interior, they left the basin of the stream, which evidently has its source from a high plateau not very distant from the coast. They now suffered much from want of food and water, but continuing on reached the N'yambo, a stream flowing eastward, and which brought them to the Alima, a large river not indicated upon any map. It was here 165 yards broad and sixteen feet deep, and is thought to be one of the affluents of the Congo. They followed it for some distance partly on foot, partly in canoes, but owing to the attacks of the savages were finally obliged to abandon the stream, which continued to run eastward. The country was here a vast swamp, the houses of the natives being built on piles. Turning towards the north the tribes proved less inhospitable, but provisions were procured with difficulty, and they were frequently from twenty-four to thirty hours without food. After crossing several streams, all of which flowed eastward, the expedition was obliged to separate; M. de Brazza pursuing his journey beyond the equatorial line, while Dr. Ballay awaited him at the falls of Poubara. The rainy season drawing near, the former rejoined his companions, and descending the Ogowé the expedition arrived at Gaboon on November 30, 1878. During the last five months they had to march barefooted. About 800 miles of ground were covered, nearly all of which was previously unknown. M. de Brazza contemplates renewing his attempt during this year and exploring some of the other affluents of the Ogowé, which may prove of greater importance than the branch now made known. A cor-

respondent of the *Athenæum* (February 22, 1879) says: "The experience of M. de Brazza confirms Mr. Stanley's description of the warlike character of the tribes on and near the Congo, and we may fairly infer that no exploration of these regions can be successfully carried out except by a strong party, and by the occasional resort to force, in order to overcome the opposition of the hostile tribes." MM. de Brazza and Ballay are now in Paris, where they have received many honors, including the bestowal of the great gold medal of the Paris Geographical Society.

Herr von Koppenfels has recently been exploring the country inland from Gerisco bay, in West Africa, a little to the north of the Gaboon. He ascended the river Muni as far as the rapids of the Tampuni, and traveled thence by land, apparently following Du Chaillu's track. In the Crystal mountains he fell in with tribes absolutely unknown to Europeans. They are weak, poor and very inoffensive. Their country abounds in elephants and gorillas whose depredations are much dreaded, as the people appear to have no means of protecting plantations or gardens from their incursions. The tribes dwelling further inland are described as peaceable.

Herr Schütt, who has been sent by the German African Society to explore the interior of West Africa, from Loanda, has been attacked and robbed by the Bengala tribe on the Quango river, and been obliged to turn back to M'Banza Muango, on the river Lui ( $9^{\circ}$  S. lat.). He has prepared a tolerably correct map of the entire plateau between  $8^{\circ}$  and  $10^{\circ}$  S. lat. with all the numerous streams that flow from it. He was determined to continue his work, and was, when last heard from (August, 1878) preparing to cross the Quango and open up the direct way to the north.

Major Serpa Pinto has arrived at Pretoria, in the Transvaal, with eight followers, the remnant of four hundred. In the January number of the *NATURALIST* we mentioned his intended departure from Bihé for the Upper Zambesi on the 18th of May, 1878. He telegraphs to the Portuguese government, "In concluding my journey across Africa, I struggled with hunger, thirst, the natives, floods and drought. I have saved all my papers—twenty geographical charts, many topographical maps, meteorological studies, drawings and a diary of the complete exploration of the Upper Zambesi, with its seventy-two cataracts." He says, according to the *Nature*, "he has discovered the secret of the Cubango, by which he seems to mean the river which under various names was for a time taken by some to be the upper course of the Congo." Major Pinto's companions, Capello and Ivens, who separated from their leader at Bihé, have not as yet been heard from.

The (English) Baptist Missionary Society have, according to the Academy, decided to despatch an expedition under Mr. T. I. Comber, with instructions to make San Salvador, to the south of Yellala falls, the base of operations, and if possible to occupy

Makouta, to the north-east of that place; they are further to leave no effort untried to reach the Upper Congo river near Stanley Pool (about 4° S. lat. 17° E. long). It is contemplated to send a small steamer in sections for the navigation of the Upper Congo. San Salvador district is much more healthy than the coast, and the country is very productive. The people are described as very quiet.

#### MICROSCOPY.<sup>1</sup>

ON A STANDARD FOR MICROMETRY.<sup>2</sup>—When the subject of a standard for micrometry came before this society at the suggestion of the late National Microscopical Congress, we found ourselves unable to vote satisfactorily upon it; not for want of any definite desire in respect to it, but because it seemed evident that a mere affirmative or negative answer to the proposals of the congress would not accomplish any desired result. For a few individuals or societies to commit themselves positively either for or against the proposals might even render valuable progress on this important subject more difficult. The differences of opinion were so strong and so reasonable, and the other interests involved were so diverse and wide spread, as to call for a thorough conference before adopting any definite policy. We therefore proposed a national committee to investigate the subject, confer with persons wishing to be heard or likely to give valuable information in respect to it, and place the data thus obtained at the service of all parties interested. As yet we have heard of no opposition to the appointment of the proposed committee. The whole spirit of the world's science at the present day calls for the highest possible precision in determining questions of the form and size of objects. It is well known that such precision has not yet been attained in micrometry; and it is difficult to believe that any one who desires to give a respectful hearing to the wishes of his fellow students, could seriously object to submitting this manifestly important subject to the consideration of a suitable committee. Whether in favor of one action, or of another, or of none, we should certainly be willing that all opinions and preferences be heard before making our final decision.

As to the course which should be adopted by the committee, or recommended to the country, there is, however, the greatest room for reasonable differences of opinion. And the same reasons which make a committee necessary, should require us to submit our views with candor and plainness, but without demanding or expecting that they shall be adopted as a whole. A fair hearing and a respectful consideration is all that can be asked by any one in such a case. And for the same reasons, any action

<sup>1</sup> This department is edited by Dr. R. H. WARD, Troy, N. Y.

<sup>2</sup> Remarks at the Microscopical Section of the Troy Scientific Association, December 2, 1878, by R. H. Ward, M.D.

taken by a committee or by any society or group of societies, should be suggestive or advisory and not positive or dictatorial.

There may even be some who believe that nothing useful can be accomplished in this field; but a second thought may show that much good can be effected, without doing anything of doubtful expediency. It seems unfortunate that in the suggestions of the congress more prominence was given to those points in regard to which there is greatest difference of opinion, and most intelligent doubt as to what ought to be done, than to the more important want underlying them. What we need is precision, first, and afterwards uniformity of nomenclature if we can get it. The essential part, on which all should agree, is that statements of size and distance should have a definite meaning; that when an author mentions, for instance, the 1-1000 of an inch, or the 1-100 of a centimetre or of a millimetre, that statement should mean one and the same thing to him, the writer, and to all intelligent readers. This certainly is not true in regard to the measurements made and recorded with the microscope in the past or at the present time. The best stage micrometers in use, as a basis for measurements, are well known to differ among themselves by various and easily measurable discrepancies which must represent errors on one side or both. In comparing micrometers from different sources, differences of two per cent. have been often noticed, and sometimes as high as six per cent. Far less errors than these, and as are quite generally present, must greatly impair the scientific value of all measurements; and it may be safely said that the exact degree of accuracy of the instruments used, and therefore of the measurements recorded, by observers with the microscope, is seldom known to the authors themselves, and scarcely ever to the readers of their papers. Nor can individual care and labor overcome this difficulty. A student can reject conspicuously bad rulings, and take the average of the best within reach; but cannot know, at last, exactly how well his best scale represents its nominal value. To determine how nearly the 1-100th of an inch on our glass plate corresponds to the 1-3600th of the standard yard in London or of our national copy of that standard in Washington, is a most valuable result which can be attained only by concerted action, and is well worthy the labor of any committee or of any society. We need a tangible inch, whether called a "standard" or not, which should be, as nearly as can be detected by the modern microscope, or by any other known means, the 1-36th part of the standard yard; or a centimetre corresponding equally well with the 1-100th of the standard metre; or some other equally determined unit, which should be officially recognized as authority for all who desire the greatest attainable accuracy. If so accurate a subdivision exists among the national standards at Washington, it might be verified by the committee, and arrangements sought from those having it



in charge by which it could be made practically useful to the microscopists of the country. If such a standard does not exist, one should be made; or if it is not within the power of our present art to give results in which the microscope cannot find a fault, then the end could be attained, measurably well, by selecting a standard as perfect as possible, and attaching to it a statement of its carefully determined error.

This standard, if it be proper to call it a standard at all, should be selected by, or made for, the committee, should be the property of the nation, and should have no mercantile relations whatever. By means of a limited number of very carefully verified copies, which could also be used as a means of reconstruction in case of accidental destruction of the original, it could be rendered available to all persons who make or use micrometers. The cheapest commercial scales, even, could without increase of price be accompanied by a statement as to how closely the work of the screw which ruled them has been found to correspond with the standard; and all plates claiming a high degree of accuracy could be carefully compared, space for space, and accompanied by a statement of the ascertained error of each individual space. Persons of really scientific training would gladly incur the extra expense of such a corrected scale. Even a series of microscopical measurements already completed and published might, in some cases, receive additional value by a note, added in later editions, stating how nearly the apparatus used by the author has been found to correspond with the standard afterwards adopted.

Of course this standard would deserve the name only in a limited sense, and not in the same sense as the standard yard in London and the standard metre in Paris; but it would be an officially recognized representative of some unit practicable in microscopy, and it might be made to add greatly to the uniformity and value of our work.

The material of which the standard should be made, the form it should take, the manner in which the spaces should be indicated, the temperature at which it should be standard, and the manner in which it should be made available to the public, and in which its safety could be best secured, could only be determined after careful consideration of the world's recent experience in respect to the care and use of precise measures of length. It has even been debated whether the practical standard should be a ruled plate or a spacing screw for use in ruling plates. But as the work of a screw is known to vary considerably according to the conditions of its use, some of which conditions are not easily controlled, the adoption of a screw, however accurate it might be, would be likely to result in the dissemination of a number of ruled plates possessing equal authority as standards, but differing measurably from each other. Whether the micrometric standard should be taken from our national standard, at Washington,

which is itself a copy, or from the world's standard in Europe, and whether coöperation with other countries is feasible in this work, are important questions for consideration.

Whether the standard secured should be a fraction of the yard or of the metre, and how large a fraction, I, for one, should scarcely have an opinion until the committee should ascertain how generally each system is used by the workers of the country, and how freely those workers would be willing to adopt the new system by general agreement. Whichever system is adopted, many microscopists would be glad to have a convenient unit in the other system, verified by comparison; a standard centimetre divided into one hundred parts, for instance, being accompanied by an inch similarly divided and having, microscopically, the same relation to it that it has mathematically. This method, of possessing a practical standard in each system while technically improper, would be a convenience, and would give a great improvement in our micrometry. Nor would the objection that it might hinder the universal adoption of the scientific (metric) system be a serious difficulty to my mind. The adoption and rejection of systems is a matter of evolution, not artifice, and the world will move at a rate that depends upon its average interests, without being much affected by special efforts to advance or retard its progress.

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#### SCIENTIFIC NEWS.

— The President nominated Clarence King for the directorship of the U. S. Geological Survey recently created by act of Congress, and the newspapers state that the Senate has confirmed the appointment. Of Mr. King's merits as a geologist we need not speak, as the Report of the Survey of the Fortieth parallel is an enduring monument to his ability. We shall hope that the fullest measure of success may attend the new Bureau and its distinguished director.

— It is with great regret that we learn that Frank A. Bradley, the well-known geologist, was recently crushed to death by the caving of the wall of a gold mine in Georgia. Mr. Bradley had at different times filled positions on the geological surveys of various States, including New York, Illinois, Tennessee and Georgia. He wrote many reports, and is the author of a geological map of the United States.

— Prof. George B. Wood, president of the American Philosophical Society, and formerly professor of the Institutes of Medicine in the University of Pennsylvania, recently deceased at the age of eighty-two years. He is well known as the author of Wood and Bache's Dispensatory, the standard work on the subject in this country. He left important legacies to the University

of Pennsylvania, including an endowment for several chairs in connection with the medical department; to the American Philosophical Society, etc.

— Prof. Samuel T. Sadtler has recently been elected to the chair of chemistry in the Department of Arts of the University of Pennsylvania. Prof. Sadtler is a native of Pennsylvania, and is well known as an expert in the analyses of mineral oils, etc.

— The Buenos Ayrean collection of vertebrate fossils, exhibited at the Paris Exposition arrived at Philadelphia by the *Indiana*. It is to be exhibited in the biological department of the Permanent Exposition.

— B. Waterhouse Hawkins has been lecturing on vertebrate palæontology, in London, this winter.

— It appears by a paper communicated to the Geographical Society of Paris, by M. Jules Garnier, that in the island of New Caledonia the usual vegetable productions of the tropics grow well on the island, but excepting coffee and tobacco they were subject to periodical destruction by invasions of grasshoppers.

— We have received the Constitution and Record of Organization of the State Natural History Society of Illinois, with a list of original members, which number fifty-two. This is one of the most active scientific organizations of the West.

— In the Proceedings of the Zoölogical Society of London, lately received Mr. T. J. Parker publishes a note confirmatory of Prof. Moebius' account of the stridulating organs of the spiny lobster (*Falinarus vulgaris*). The noise or stridulation is almost equally audible in water and air. Moebius compared it to the sound produced by pressing the upper leather of a boot against a table leg.

— A valuable paper by Prof. Vogt on the adaptation of Copepodous Crustacea to parasitism, appears in the last received number of *Actes de la Société Helvétique des Sciences Naturelles*. Bex, 1878. The author believes that evolution should be studied from an examination of parasitic and blind animals, as showing the influence of a change in the environment on the structure of the animal.

— At a recent meeting of the London Entomological Society the Rev. A. Eaton exhibited a piece of "Kungu cake" from Lake Nyassa district, where, according to Livingstone and others, it is used extensively as food by the natives, who manufacture it from large quantities of a minute insect, conjectured to be a species of *Ephemeridæ*. From an exhaustive examination, however, Mr. Eaton found it to be a minute representative of the Culicidæ, or mosquito family, probably belonging to the genus *Corthra*. In connection with the subject of insect-food as used by

man, Mr. Distant remarked that he had learned from Mr. Chennell that *Erthesina fullo*, a very common eastern hemipterous insect was largely eaten by the Naga Hill tribes of North-eastern India. Mr. Meldola remarked that chitine, which comprised the crust of insects had been shown by analysis to contain about six per cent. of nitrogen, and as regards phosphates, Mr. Wm. Cole had burned some insects and found phosphoric acid in the ash.

• — A laborious work, redounding to the credit of both parties, is Mr. Samuel Henshaw's list of the entomological writings of John L. LeConte. It forms a pamphlet of eleven pages, edited by George Dimmock, and is No. 1 of Dimmock's Special Bibliographies. Dr. LeConte has thus far published 250 papers and works. We hope to record the publication of many more from his pen. The second number comprises the entomological writings of George H. Horn, compiled by Samuel Henshaw, edited by George Dimmock. The titles number 80. The third part is in preparation, giving a list of the writings of Samuel Hubbard Scudder; compiled and edited by George Dimmock. Mr. Scudder's writings number over 250 titles. These have, or will appear in the Advertiser of *Psyche*, the organ of the Psyche Entomological Club, Cambridge. These bibliographies are done with unexampled faithfulness and care, and can be purchased of the editors of *Psyche*, Cambridge, Mass. This journal desires and needs more subscribers. The subscription is \$1.00 a year. It is doing a good work for the progress of entomology in this country, and contains matter of much general interest; the bibliographical portion being a valuable feature. We would only make one criticism, *i. e.*, in the use of lower case initial letters of names of genera and higher groups; this is an innovation which we should not desire to see followed.

— The fourth volume of the Transactions of the Wisconsin Academy of Sciences, Arts and Letters, just received, among a number of comparatively worthless papers, contains besides Prof. Birge's notes on Cladocera, already noticed in this journal, a paper by Dr. E. Andrews on discoveries illustrating the literature and religion of the Mound-builders. Dr. P. R. Hoy contributes two papers entitled, How did the Aborigines of this country fabricate copper implements? and Why are there no upper incisors in the Ruminantia? Dr. J. N. de Hart writes on the antiquities and platycnemism of the Mound-builders of Wisconsin, while Prof. T. C. Chamberlain publishes an essay on the extent and significance of the Wisconsin kettle moraine.

— At its last session Congress appropriated \$10,000 for the completion of the investigation of the Rocky Mountain locust by the United States Entomological Commission. The work during the coming season will be carried on in Colorado and the Western Territories, particularly Utah and Eastern Idaho, where the locust abounds each summer, doing more or less damage.

Parties will also be sent into Montana, the main breeding place of the destructive swarms periodically visiting the Western Mississippi States.

— The cryptogamous division of the Herbarium of the Boston Society of Natural History has been enriched by the discovery of a valuable collection of lichens. This was formerly the lichen-herbarium of Dr. Thomas Taylor, an Irish botanist, to whom Sir W. J. and Sir Joseph Hooker communicated the whole of their extensive collections of lichens, gathered during many exploring expeditions. Dr. Taylor published descriptions of these plants in the *London Journal of Botany*, 1844-46, and many of the specimens are the originals of the descriptions. In 1850, Mr. John A. Lowell purchased the collection from Dr. Taylor's heirs, and it formed a part of the herbarium subsequently presented by him to the Society. The knowledge of the structure of lichens has been greatly advanced since Dr. Taylor's day, by the use of the microscope, and the nomenclature has undergone extensive changes. This herbarium, though consisting of over a thousand species, might have remained comparatively useless to the American student, had it not been for the voluntary services of Prof. Edward T. Tuckerman. He has examined and named very nearly the entire collection, a work which no one else in this country could have done, and has given it an authentic value otherwise unattainable.

— The French Academy of Science has elected M. Marey, Professor of Animal Mechanics in the College de France, to M. Claude Bernard's vacant chair.

— In a recent report to Parliament, it seems that last year 21,682 fatal cases from the attacks of wild animals had occurred in ten provinces of India, the largest number being in Bengal, namely, 10,062. The deaths from snake bites alone in the Punjab last year, were 828 against 979 in the preceding year.

— As our readers are aware, the three great geological surveys under Hayden, Powell and Lt. Wheeler are, by Act of Congress, to be discontinued after the 30th of June, and to be replaced by a new U. S. Geological Survey in charge of Mr. Clarence King, late geologist of the Survey of the Fortieth Parallel. It was as far as we are aware the original understanding when the matter was referred by Congress to the National Academy of Sciences to simply consolidate the existing geological surveys, but the report of the Committee was so worded that these surveys were abolished outright instead of being consolidated. The amount appropriated for the new geological survey is \$100,000, a little more than each of the other surveys have formerly received. Thus the work is apparently to be greatly curtailed, and science and the best interests of the western people will, in a corresponding degree, suffer.

It is greatly to be regretted that the work is in the future apparently to be conducted on so narrow and limited a scale, for which the scientific world may thank the two or three naturalists who have been conspicuous in shaping legislation in this whole matter. It has even been strongly intimated that hereafter no zoölogy and botany is to be connected with the future geological work. This is to be deprecated by biologists throughout the country, who are probably unaware how much has been done to influence those in authority at Washington, and to prejudice them against giving national aid to these sciences. All this is a new feature in the history of science in this country, and has been, we are led to believe, the result of narrow, local private jealousies, rather than from any generous, catholic, scientific spirit. Since the time of Lewis and Clark's Expedition, naturalists have been sent out with the national scientific expeditions, at little expense to the general government; with nearly all surveying parties, topographical and geological; the reports of the naturalists of the U. S. Exploring Expedition, of the Pacific Railway Surveys, of the naturalists who have prepared the botanical and zoölogical reports of Hayden's Survey, have added immensely to the prestige of American biological science; it has been done at little extra expense, most of the cost of printing not having been paid for out of the funds appropriated for the surveys themselves. No richer results in biology and palæontology and physical geology combined have been elicited in this country than the researches carried on by Pourtales, the two Agassizs and those associated with these scientists, in the dredgings made in deep water from Florida to Maine on the vessels of the U. S. Coast Survey; and yet it has been urged on legislators and those in authority at Washington, with singular inconsistency, by certain of those who have and are even now enjoying the results of the biological work thus inexpensively carried on with the U. S. Coast Survey, that no zoölogy or botany should be connected with the geological surveys!

From the very fact that the largest, best known survey in this country and in Europe, one which more than any other survey in this country, unless we except the New York State Survey, has won the warmest sympathy and interest from the leading geologists and palæontologists of Europe—from the very fact, we say, that the survey in charge of Professor Hayden has been conducted in a liberal, catholic way, and so as to promote and diffuse among the people who are paying for the work done, a knowledge of the natural resources of the Far West, we had hoped that after more than twenty years of service in the field, he would have been allowed to extend and complete the work in the manner already begun. We would see no curtailment of the work, and in voting in the meeting of the National Academy for consolidation, we supposed that with the moral support of the Academy, Congress would vote still larger supplies, and have the work done in a liberal, broad, comprehensive spirit consistent with

the magnitude of the interests involved, and especially that no grave injustice would be done in selecting those who should have charge of the work. There was room for the employment of all who were engaged in the work now going on, and we firmly believe that had Prof. Henry, the lamented promoter of American science in its broadest spirit, presided over the councils of the National Academy, the result would have been far different.

Mr. King has our congratulations and best wishes, and we trust he will liberally construe the recent Act of Congress, and conduct the surveys to be under his charge in the liberal spirit already shown in the series of elaborate reports of the Fortieth Parallel, one of the most expensive of which treats of the botany of the Survey.—A. S. Packard, Jr.

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### PROCEEDINGS OF SCIENTIFIC SOCIETIES.

PROCEEDINGS OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, Jan. 22.—President Ruschenberger in the Chair. Mr. Meehan called attention to some specimens of *Solidago odora*, which was used in some parts of Pennsylvania as tea. Mr. Ashburner exhibited some charts intended to illustrate the geological faults in Jack's mountain, Pa. Mr. Potts exhibited some silk-worm cocoons in which the skin cast off from the trachea within was shown, and also that two worms spun a single cocoon in co-partnership. Mr. John Ford exhibited an oyster, the shell of which was almost destroyed by the common boring sponge.

Jan. 28.—The President in the Chair. A paper entitled, Further Notes on the Mechanical Genesis of Tooth-forms, by John A. Ryder. Dr. Leidy exhibited a mass of worms from Cecil county, Md., supposed to be *Gordius robustus*, also the liver of a rat much infested with *Cysticercus*.

Feb. 4.—The President in the Chair. Dr. Leidy described the fossil jaws and teeth of a deer from Muscatine, Iowa, for which he proposed the name *Cervus muscatinensis*. Dr. H. C. Chapman made a communication on the chimpanzee which recently died at the Zoölogical Garden, arriving at the conclusion, and agreeing with Prof. Owen, that the cerebrum did not fully cover the cerebellum, as held by Huxley and others. Detailed comparisons were also made in regard to the arrangement of the muscles.

MIDDLESEX SCIENTIFIC FIELD CLUB, Malden, Mass., organized March, 1878.—The Club held its first annual meeting March 5, 1879, and elected the following officers: President, Henry L. Moody; vice-presidents, Rev. Geo. P. Huntington, Frank S. Collins, Mrs. P. D. Richards; corresponding secretary, Geo. E. Davenport; recording secretary and treasurer, F. W. Morandi; custodian, Miss Hattie Silvester; Exec. Com., L. L. Dame, Geo. E. Davenport, Mrs. Annie U. Moody, Miss Martha Silvester, F. W. Morandi.



The Club propose to investigate, and, if possible, establish a museum illustrating the natural history of Middlesex county.

For this purpose special departments in the different branches of natural science have been organized, under the direction of the Executive committee, and the botanical department has been divided into sections for the better prosecution of that portion of the Club's work.

Mr. Dame, assisted by Mr. Huntington and Mr. Roscoe Frohoch, will have charge of the Phænogamous sections, Mr. Davenport of the vascular Cryptogams, and Mr. Collins of the Algæ.

The entomological department will be in charge of Mr. Moody, and the ornithological department conducted by Mr. Wm. B. Gibbs. Communication with the Club may be had by addressing the corresponding secretary, at Medford, Mass.

NEW YORK ACADEMY OF SCIENCES, March 17.—Mr. A. A. Julien gave an account of simple devices in determinative lithology, and Prof. T. Egleston read a paper on pre-historic mining at Lake Superior.

AMERICAN GEOGRAPHICAL SOCIETY, New York, April 8.—Mr. William I. Marshall read a paper on the Yellowstone National Park, with a description of the wonders of that region.

APPALACHIAN MOUNTAIN CLUB, Boston, April 9.—The Councillors presented their spring reports, and a paper was read by Prof. F. W. Clarke, entitled a trip to North Carolina, describing the mountains of that State.

April 16.—Mr. Justin Winsor delivered an illustrated lecture on the earliest maps of the American continent.

BOSTON SOCIETY OF NATURAL HISTORY, April 2.—Rev. G. F. Wright made a communication on the medial and terminal moraines of New England. Mr. Warren Upham read a paper on the glacial drift in Boston and vicinity, and Dr. C. S. Minot remarked on histological differentiation.

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#### SELECTED ARTICLES IN SCIENTIFIC SERIALS.

SIEBOLD AND KÖLLIKER'S ZEITSCHRIFT FÜR WISSENSCHAFTLICHE ZOOLOGIE.—March 13. The Anatomy of *Amblystoma weismanni*, by R. Wiedersheim. On pelagic Annelidans from the shores of the Canary islands, by R. Greef. The motions of our land snails, by H. Simroth.

AMERICAN JOURNAL OF SCIENCE AND ARTS.—The Vertebrae of recent birds, by O. C. Marsh. The lower jaw of *Loxolophodon*, by H. F. Osborn and F. Speir, Jr. Notice of recent additions to the marine fauna of the eastern coast of North America, by A. E. Verrill.

THE CANADIAN NATURALIST.—March 22. Remarks on recent papers on the geology of Nova Scotia, by J. W. Dawson. Notes on the glaciation of British Columbia, by G. M. Dawson.

